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SUPPLEMENT NUMBER 5 ON WAR MEDICINE AND SURGERY.

Soft Tissue Injuries.

MENINGOCOCCAL INFECTIONS IN INFANCY AND CHILDHOOD.¹

PART II. MENINGOCOCCAL SEPTICEMIA, WITH SPECIAL REFERENCE TO ADRENAL APOPLEXY OR THE WATERHOUSE-FRIDERICHSEN SYNDROME.²

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MENINGOCOCCAL INFECTION presenting clinically as septicæmia is observed most frequently in epidemic phases of cerebro-spinal meningitis. During the course of epidemics of cerebro-spinal meningitis septicæmia is of relatively frequent occurrence; probably septicæmia precedes the meningeal infection in the majority of cases of meningitis, if not in all of them. During epidemics of the disease a high percentage of positive results can be obtained by blood culture in cases of acute meningococcal meningitis. In the majority of cases in which the meningococcus invades the blood stream, localization of the infection occurs in the meninges; however, in a certain proportion the meninges are not invaded. The reason for this is inadequately understood.

Meningococcal septicæmia is a disease of protean clinical manifestations; all grades of severity are encountered from an infection of so mild a nature that the patient suffers only slight malaise for a few days and recovers without therapeutic aid, to an infection of such fulminating character that death may occur in so short a time as five hours from the onset of the symptoms.

During a period of five years, from 1937 to 1942, 38 patients suffering from meningococcal septicæmia have been admitted to the Children's Hospital, Melbourne. With three exceptions, all such cases have arisen during the course of two epidemics; 10 cases were derived from a local epidemic of 30 cases of cerebro-spinal infection at the Broadmeadows Foundling Home during the period from 1937 to 1939³ and the remaining 25 were the result of the epidemic in Melbourne during the period from 1940 to 1942. This series of 38 cases has been classified into groups according to the clinical and pathological features. It is proposed to discuss these groups separately; but it is to be remembered that they are all different manifestations of the one disease.

Fulminating Meningococcal Septicæmia with or without Adrenal Apoplexy: the Waterhouse-Friderichsen Syndrome.

Many writers have described a syndrome in which the sudden onset of an acute infection is followed by a fulminating course and death in twenty-four hours or less. The chief clinical characteristics are drowsiness, which passes rapidly to a state of either delirium or stupor and finally to coma, a profound circulatory failure with hypotension, and an extensive purpuric eruption of the skin. Cyanosis, which is frequently of variable intensity, dyspnoea and hyperpyrexia are other common manifestations. Coma, profound circulatory failure and a purpuric eruption are present almost without exception. Pathologically, this syndrome is the result of septicæmia, usually meningococcal, and the morbid anatomical examination discloses bilateral destruction of the adrenal glands by hemorrhage. Many people attribute the clinical manifestations, particularly the circulatory collapse and coma, to the abrupt cessation of adrenal function which results from the destruction of the glands by interstitial hemorrhage. Waterhouse in 1911,⁴ and Friderichsen in 1917, suggested that these symptoms and morbid anatomical findings constituted a clinical

¹The first part of this paper was published in the issue of December 19, 1942.

²The majority of the patients of this series were observed by me at the Children's Hospital, Melbourne, during the years from 1937 to 1942.

entity, and Glanzmann first proposed that this illness be given the name of the Waterhouse-Friderichsen syndrome. Later writers have concurred with this view, and many of them, among whom are Carey,⁽⁶⁾ Usher,⁽⁷⁾ Sacks,⁽⁸⁾ Kundstadter⁽⁹⁾ and Aegerter,⁽¹⁰⁾ hold that a diagnosis can be established with accuracy prior to death.

Seventeen patients during the years 1937 to 1942 have been presented at the Children's Hospital with fulminating meningococcal septicæmia, and in nine of them bilateral adrenal hæmorrhage was found at autopsy. The clinical features of the illnesses of all seventeen children were very similar, and a careful study has led me to believe that it is impossible to predict which patient will be found at autopsy to have adrenal hæmorrhage and which will not. In several instances in which I confidently predicted adrenal hæmorrhage, post-mortem examination proved me to be wrong; and furthermore, several post-mortem examinations disclosed adrenal hæmorrhages when there seemed to be insufficient clinical evidence to suggest the probability. A detailed clinical analysis of the two groups of patients, the one with adrenal apoplexy and the other without, will be given, and it will be apparent that the two groups cannot be separated on clinical grounds.

Of the nine patients who had bilateral adrenal hæmorrhage, four were proved to have meningococcal septicæmia, the blood culture made prior to death yielding a profuse growth of meningococci. The diagnosis in the remaining five cases was established on clinical grounds, attempted blood culture having been technically impossible or precluded by the limited time available for carrying it out prior to the patient's death. These children presented a clinical picture identical with that of those whose blood yielded a positive finding on culture. All patients became ill during a period when cerebro-spinal meningitis was epidemic, either at the Broadmeadows Foundling Home (1937 to 1939), or at Melbourne (1940 to 1942). The patients varied in age from one month to six years, the average age for the group being two years and eleven months. The majority of these nine patients were suspected of having an associated meningitis, and all were subjected to lumbar puncture; in eight of them the cerebro-spinal fluid was clear, and in it no other abnormality was detected than the presence of two to twenty polymorphonuclear cells per cubic millimetre; but in one case faintly opalescent cerebro-spinal fluid was obtained, containing 200 polymorphonuclear cells per cubic millimetre, and yielding a growth of meningococci on culture. The cerebro-spinal fluid of two other patients yielded growths of meningococci. In the three last-mentioned instances and in one other, neck stiffness was quite pronounced.

Three of the series of nine patients had been noticed by the parents to have a cold several days prior to the onset of symptoms; but the remainder were perfectly well. All children had been healthy, and their growth and development had been normal. An outstanding feature of the illness was the rapidity of onset and the fulminating course; not infrequently the child went to bed perfectly well, awoke in the morning vomiting, became seriously and progressively ill throughout the day, and died during the night. The rapidity with which death occurred so stunned many parents that they repeatedly exclaimed: "But baby was perfectly well this morning!" Vomiting and drowsiness were the common initial symptoms, and without exception the drowsiness passed on to a state of either stupor or delirium and then to coma. Generalized convulsions were observed in four instances. Right lumbar and abdominal pain occurred in one, so that in the initial phases of the illness the child's doctor suspected an attack of acute appendicitis. Another cardinal feature of the condition was the rapid onset of a state of circulatory failure; usually this was obvious on the child's admission to hospital. The pulse was rapid, weak or thready, or frequently imperceptible; the blood pressure of four patients could not be recorded four or five hours prior to death. The extremities were cold and the capillary circulation was poor. In five patients a curious "blotchiness" of the skin, similar to post-mortem staining, was observed, and this "blotchiness" frequently moved to

various parts of the body from hour to hour; it is probably to be attributed to failure of the capillary circulation. Dyspnoea was a striking feature in four cases; the respirations were rapid and deep and suggestive of the air hunger witnessed in severe diabetic coma. Two of these patients were suspected of having acute pneumonia, as râles were audible at the lung bases. The type of dyspnoea suggested central stimulation. Dyspnoea of a lesser degree was noted in two other instances. Intense cyanosis, out of proportion to any pulmonary or circulatory embarrassment, was observed in five cases and a mild degree was present in four. Two of the patients exhibited extreme pallor with a faint greyish tinge. Hyperpyrexia occurred in six cases, the temperature recorded being over 105° F. and in several instances over 108° F. In one case the temperature would not register on the patient's admission to hospital, but several hours later it reached the level of 109° F. It is striking to feel the cold extremities and then to witness the thermometer register a temperature of 107° or 108° F. The course of the disease in all of these cases was rapidly fatal. One child died in so short a time as five hours after the appearance of the initial symptoms. The longest period of illness was thirty-six hours, and the average total time of illness for the group was only twenty-one hours. In an illness of such dramatic clinical manifestations one would expect gross and extensive morbid anatomical findings; but examination disclosed a paucity of abnormal features, apart from a total or extensive destruction of the normal architecture of both suprarenal glands by hæmorrhage; in several cases the suprarenal glands were best described as sacs of blood and blood clot, no glandular tissue being identifiable macroscopically. Minor toxic changes were observed in all organs; the lungs and brain were hyperæmic, and petechial hæmorrhages were frequently noted in submucous and subserous situations.

Eight patients suffering from fulminating meningococcal septicæmia presented an identical clinical syndrome to the nine patients suffering from septicæmia and adrenal apoplexy, and the disease ran a similar clinical course; post-mortem examination revealed similar changes, with the exception that the adrenal glands were not destroyed by hæmorrhage. The ages of these eight children varied from seven months to three and a half years, the average being two years. All became rapidly acutely ill, two patients having had what the parents regarded as a cold for several days. Vomiting was the common initial symptom; only two patients of the eight did not display this feature. Drowsiness or listlessness rapidly followed, then either delirium or stupor, and finally coma supervened. These symptoms differed in no way clinically from those exhibited by the patients who had adrenal hæmorrhages. Three patients had severe generalized convulsions. Cyanosis out of proportion to any pulmonary or cardiac embarrassment was obvious in six out of the eight patients. Dyspnoea was a prominent feature in four cases, was slight in two, and was not observed in two. Neither the degree nor the type of dyspnoea or cyanosis differed in any manner from that exhibited by the patients affected with adrenal apoplexy.

Severe circulatory failure developed in all cases; hypotension was extreme, and in three cases in which an attempt was made to estimate the blood pressure several hours prior to death, no reading could be recorded. The clinical features of the circulatory failure were paralleled in the cases of adrenal apoplexy. Hyperpyrexia was a common feature, six patients having a temperature of over 105° F., and in several instances a recording of over 107° F. was observed. Blood culture yielded a profuse growth of meningococci in five cases, but in one an attempt at culture made post-mortem produced no growth of organisms. One child's sister had died of meningococcal meningitis in the Children's Hospital two weeks previously. An examination of the cerebro-spinal fluid was made in seven cases, and in only one was a culture of meningococci obtained. The specimens of fluid were all macroscopically clear, and apart from containing from two to twenty polymorphonuclear cells per cubic millimetre, exhibited no abnormality. Five patients displayed neck stiffness.

In Table I a comparison of the cardinal clinical features of the illness in the two groups of patients is presented. It is evident that there is no essential difference between the two groups.

TABLE I.

Clinical Feature.	Meningococcal Septicæmia and Adrenal Apoplexy. (Nine Patients.)	Meningococcal Septicæmia. (Eight Patients.)
Coma	9	8
Circulatory failure and hypotension	9	8
Purpuric eruption of the skin	9	8
Vomiting	7	6
Hyperpyrexia (over 105° F.)	6	6
Convulsions	4	3
Dyspnoea	6	6
Cyanosis (gross)	5	6
Average total number of hours of illness	21	22

It is readily evident that there is no essential clinical difference between the groups, and a decision as to which patient will have adrenal hæmorrhage is not possible on clinical grounds. Biochemical investigations were not conducted in any of the cases; whether it would be possible to differentiate the two groups on biochemical grounds is as yet unknown, although several writers have found hypoglycæmia and an elevation of the non-protein nitrogen content of the blood in connection with adrenal apoplexy. It is to be emphasized, however, that biochemical investigations of patients virtually *in articulo mortis* may be notoriously misleading. There is no doubt that an acute disruption of adrenal function, such as is occasioned by destruction of the adrenals by hæmorrhage, causes a gross upset in the internal economy of the body, notably in sodium and potassium and sugar metabolism and probably in maintaining circulatory control, and will result in death. However, this factor has comparatively little influence in causing death in fulminating septicæmia and adrenal apoplexy, for identical signs and symptoms result in cases of septicæmia without adrenal apoplexy. The adrenal hæmorrhage is but an incident in an explosive disease process which overwhelms all bodily resistance. Hæmorrhage from destruction of capillaries, either by embolism or toxic spilling, is apt to occur in meningococcal septicæmia, and it appears that the adrenal capillaries are more susceptible to damage than others. Hæmorrhages may occur in other fissures or organs; in one case of the eight, hæmorrhage occurred not in the adrenal glands but in the mediastinum, a right hæmothorax resulting from rupture of the mediastinal pleura; in another case a large subcutaneous hæmorrhage was observed and in yet another a sub-peritoneal hæmatoma.

A patient suffering from fulminating staphylococcal septicæmia and osteomyelitis does not die as a result of the focal bone lesion, nor does a patient suffering from fulminating meningococcal septicæmia die of the focal adrenal apoplexy. In both diseases the focal lesion is but an incident in the overwhelming blood infection.

It is evident that the diagnosis of adrenal apoplexy cannot be established with certainty prior to death, although its presence may be suspected. Unwarranted or undue emphasis has in the past been placed on adrenal hæmorrhage as the immediate cause of death and the cause of many of the symptoms in the so-called Waterhouse-Friderichsen syndrome.

Pyogenic Manifestations of Meningococcal Septicæmia.

In exceptional circumstances the meningococcus displays pyæmic tendencies, and frank suppurative lesions may occur in the lungs, the pericardial sac, a joint, the

peritoneal cavity, or other organs or tissues.¹⁰ One patient in this series of 38 displayed a number of these features; his case history is worth recording in some detail.

D.B., a healthy, normal, male child, aged two years, became ill over a period of three days; during the first day he was listless and drowsy and refused his food. On the second day the mother noticed that his breathing was rapid and caused some distress. On the third day he was obviously very ill; the dyspnoea was now pronounced, the colour was greyish, and the child was stuporose.

On examination at hospital, it was readily evident that he was very ill; he was cyanosed and dyspnoic, with all the clinical indications of circulatory failure. The pulse was barely perceptible at the wrist, the extremities were very cold, the capillary return was poor and the skin of the abdominal wall was mottled in appearance. The neck was a little stiff and Kernig's sign was elicited. An extensive petechial eruption was observed on the trunk. The heart and lungs appeared normal, but the abdomen was distended and a little rigid on palpation. Lumbar puncture produced opalescent cerebro-spinal fluid, culture of which resulted in a growth of meningococci; the blood culture also produced a growth of meningococci. The child's condition rapidly became worse, and death supervened three hours after his admission to hospital, in spite of the intravenous administration of saline solution and the use of sulphapyridine in large doses.

Post-mortem examination disclosed purulent pericarditis, the pericardial sac containing three ounces of thick, creamy pus, an early diffuse fibrino-purulent peritonitis, and early fibrino-purulent pleurisy on the right side, an extension from meningococcal pneumonia. Bacteriological examination of the pus from the pericardial sac and peritoneal cavity revealed the presence of the meningococcus. Examination of the brain revealed extreme hyperæmia and scanty fibrino-purulent exudate along the great vessels.

The death of this patient was the result of an overwhelming meningococcal septicæmia, with localization of the infection and suppuration in the lung, pericardium, peritoneum and meninges. This clinical history demonstrates very well one pathological variant of meningococcal septicæmia.

Moderate and Severe Types of Meningococcal Septicæmia.

As would be expected, moderate and severe clinical grades of infection occur in meningococcal septicæmia. In the severe type of infection, of which there were seven examples, there was evidence of circulatory failure. Circulatory failure is the clinical manifestation indicating a severe infection. Two of these patients died.

The patients' ages varied from six weeks to twelve years. The onset of the disease was acute in all instances, vomiting usually being the initial symptom. All the children rapidly became feverish; some were drowsy and then delirious. In four cases convulsions occurred. Pain in the legs and joints was a frequent complaint, and three patients had abdominal pain. All developed a purpuric eruption, and in several cases small ecchymoses appeared in the skin. In four instances blood culture produced a growth of meningococci, and in another the meningococcus was cultured from macroscopically clear cerebro-spinal fluid. In all cases examination of the cerebro-spinal fluid revealed no abnormality other than a few polymorphonuclear cells per cubic millimetre.

All patients were treated by sulphapyridine in large doses, with the exception of two, one of whom received no effective treatment, as death occurred within three hours of his arrival at hospital. The other received 90 cubic centimetres of polyvalent anti-meningococcal serum and small doses of sulphanilamide; this child succumbed after five days, post-mortem examination revealing no abnormalities other than some pus in both middle ear cavities and mastoid air cells. The dosage of sulphanilamide was inadequate in this case. Continuous oxygen therapy was beneficial for the five patients who recovered during the severe phases of the illness when circulatory failure was present. In two cases the continuous intravenous administration of saline solution was necessary on account of severe vomiting. There is little doubt that these additional measures to combat circulatory depression

were successful in saving the lives of several of these acutely ill patients.

Four patients came to hospital with the disease in a moderately severe form. The clinical history and findings on clinical examination were similar in all cases of the group. The patients' ages varied from eighteen months to six years. All had been ill for one or two days, with vomiting, feverishness and drowsiness, followed by a purpuric eruption of the skin. Several complained of abdominal pain and of aching and pain about the joints. The cerebro-spinal fluid of each of these patients was sterile and contained no abnormal constituents other than a few polymorphonuclear cells per cubic millimetre. All were treated with sulphapyridine and made rapid and uneventful recoveries. Not one of these patients caused any worry, at no stage was there evidence of circulatory depression, and with sulphapyridine therapy recovery was so rapid that after forty-eight hours the children appeared normal.

Mild or Subclinical Infections.

In any infectious disease a certain percentage of persons contract the infection in a very mild form; in some the illness is subclinical in type. Meningococcal septicæmia is no exception to this general principle. Eight patients of this series presented with an infection of a very mild nature; most probably in the majority of the eight cases no diagnosis would have been made but for the fact that the patients all came from the Broadmeadows Foundling Home, where cerebro-spinal infections were epidemic from 1937 to 1939. Not one of these eight children, all of whom were between the ages of one and a half years and three years, was clinically ill. The nursing sisters of the home were all aware of the possibility of cerebro-spinal infections, and any child who was "off colour" was brought for examination. The clinical history was similar in all cases. A typical history is as follows. The child, who previously had been perfectly well, appeared a little "off colour" and a little feverish, and vomited several times. Several hours later a fine red papular rash developed on the trunk and limbs. The only abnormal physical sign apart from the rash displayed by any of the children was a little neck stiffness in two instances. Lumbar puncture was carried out on all of them, and the cerebro-spinal fluid was cytologically normal and sterile on attempted culture. A blood culture was made in four of the cases, and in each a growth of meningococci was obtained. Two of the patients received no treatment, apart from general nursing measures; the rash faded rapidly, and after thirty-six to forty-eight hours could not be seen; the temperature returned to normal in two or three days and the patient was perfectly normal by the third day. The remaining six patients were treated with an injection of 90 to 120 cubic centimetres of antibacterial polyvalent meningococcal serum given intramuscularly or intraperitoneally, and with small doses of either sulphanilamide or sulphapyridine. In all of these, the rash rapidly faded, the temperature returned to normal and the patient was perfectly well in two days. I am confident that if these children had presented for examination from a section of the general public at a time when cerebro-spinal infections were not epidemic, their illness would not have been diagnosed as meningococcal septicæmia. The malaise and rash would have been attributed most probably to a dietetic upset, to some toxic cause, or to rubella. The disease would very likely have been self-limiting in the six treated patients, as it was in the two untreated patients. This group affords a striking contrast to the fulminating septicæmia group, in which death occurred usually within twenty-four hours of the onset of the initial symptoms.

Subacute or Chronic Meningococcal Septicæmia.

Subacute or chronic meningococcal septicæmia has been recognised with increasing frequency during the past ten years, and many isolated examples have been reported.⁽²⁰⁾⁽²¹⁾

The cardinal features of the disease are a pyrexia, which may be constant or intermittent or may resemble that seen in some types of malaria, fitting joint pains, and a

maculo-papular rash which may occur in successive crops. The spleen is commonly enlarged and extrameningeal foci of infection may be present. The following case history is a fairly typical one:

R.K., aged eight years, was a healthy, well-developed boy, who two weeks prior to his admission to the Children's Hospital, Melbourne, complained of a sore throat and of pain in the ankle joints and later in both knees. He also complained of burning and tingling in his fingers and of some precordial pain. He did not appear ill with these pains, and despite the fever his appetite was unimpaired. He was admitted to hospital with a provisional diagnosis of rheumatic fever, without cardiac involvement.

Examination disclosed a well-nourished boy, whose temperature was 103° F.; his pulse rate was 96 per minute, and his respirations numbered 24 per minute. Apart from numerous red macules scattered over the trunk and limbs, no abnormal physical signs were detected. He was treated with sodium salicylate, but no relief of the pain in his joints and no fall in his temperature occurred; he continued in the same condition for a period of a month. During the month several successive crops of red spots appeared, each crop taking seven to ten days to fade. During this time, the urine was examined culturally, cytologically and biochemically, with negative results, the chest was radiologically examined and found normal, and the Mantoux test was performed, also with negative results. Serological agglutination tests with typhoid and with paratyphoid A and B bacilli and *Brucella abortus* gave no reaction. The leucocytes numbered 10,000 per cubic millimetre of blood. At no time was the spleen palpable. Blood culture yielded a growth of meningococci, group II, the typing being carried out through the courtesy of Dr. F. T. Wheatland, of the Commonwealth Serum Laboratories, Melbourne.

The diagnosis of meningococcal septicæmia having been established, sulphapyridine treatment was commenced, and within twelve hours the patient became afebrile and remained so. Two attempts at blood culture made subsequently resulted in negative findings, and the boy has been well since.

Discussion.

Many people consider that the Waterhouse-Friderichsen syndrome, with the striking pathological lesion of destruction of the adrenal glands by hæmorrhage, constitutes a specific clinico-pathological entity. The clinical features are most suggestive that an acute bacterial infection is the primary aetiological factor, and Andrewes in 1906⁽²²⁾ first incriminated the meningococcus, which he obtained by ante-mortem blood culture from an adult who died from bilateral adrenal apoplexy. MacLagan and Cooke in 1916⁽²³⁾ also isolated the meningococcus from the blood of a patient who died of a similar condition, and since then many workers, among whom are Battley,⁽²⁴⁾ McLean and Caffey,⁽²⁵⁾ and Aegerter,⁽²⁶⁾ have demonstrated similar bacteriological findings by blood culture. All the available evidence strongly points to the meningococcus as the organism most commonly involved; other bacteria (for example, *Streptococcus hæmolyticus*, the pneumococcus, *Staphylococcus aureus*) have, however, been identified as the specific cause of the septicæmia.

Little is known of the morbid physiology of this syndrome, although a considerable number of the symptoms have been attributed to acute adrenal failure, presumably because the adrenal glands are the only organs displaying gross pathological changes. The circulatory failure with hypotension was first held by MacLagan and Cooke⁽²³⁾ to be due to destruction of the medulla of the suprarenal gland, with consequent inability to secrete adrenaline. Coma was thought to be due to hypoglycæmia, the result of a gross disorganization of sugar metabolism. Flaccidity of the limbs was also attributed to medullary failure of the suprarenals. Several workers have found hypoglycæmia and a rise in the non-protein nitrogen content of the blood in these patients; but it must be remembered that these estimations were conducted on virtually moribund patients. The attributing of these abnormal biochemical findings solely to acute adrenal failure is open to grave doubt. Whilst it is well known that acute adrenal failure will result rapidly in death, there is very little and certainly quite inconclusive evidence that acute adrenal failure is the prime cause of death of patients suffering from adrenal apoplexy, the result of a

fulminating septicæmia. The indisputable clinical fact that eight patients suffering from fulminating meningococcal septicæmia did not exhibit adrenal apoplexy, and yet presented a clinical syndrome identical with that of nine patients suffering from meningococcal septicæmia and bilateral adrenal apoplexy, is a clear indication that adrenal apoplexy is of minor importance in causing death and the symptoms leading to death.

It would seem reasonable to regard adrenal apoplexy as due to a pathological accident in a fulminating septicæmia, the adrenal capillaries being particularly prone to damage by either embolism or toxic changes. This view is supported by the occurrence of focal hæmorrhage in other tissues in patients with fatal meningococcal septicæmia. Among the eight patients, one had a large mediastinal hæmorrhage and hæmothorax from pleural rupture, another a mesenteric hæmorrhage, and yet another a subcutaneous hæmorrhage.

The striking pathological findings of gross destruction of the suprarenal glands by hæmorrhage in subjects who have died in a dramatic manner from fulminating meningococcal septicæmia, naturally suggests that the adrenal destruction is the factor responsible for death. This view, it would seem on superficial analysis, is further supported by the comparative absence of other morbid anatomical findings to which death might be attributable. However, it must be remembered that in any patient who dies of a fulminating infection or toxæmia, be it diphtheria, tetanus, pneumococcal septicæmia, influenza or any other acute infectious disease, few and slight morbid anatomical changes will be found. The paucity of morbid changes is in striking contrast to the clinical features of the disease, which are so outstanding and dramatic, and which rapidly prove fatal. The reason for this is to be sought in the fact that our methods of examining tissues *post mortem* are not sufficiently refined to detect changes when death of the tissues has resulted rapidly and suddenly from overwhelming infection and toxæmia. Inflammatory and other defence mechanisms have not been given time or a chance to become operative, and therefore pathological evidence of defence against the infection is entirely lacking. It follows, therefore, that few if any morbid anatomical changes at death may be expected in patients who die rapidly from a fulminating illness. It is therefore suggested that the so-called Waterhouse-Friderichsen syndrome with adrenal apoplexy, which is usually attributable to fulminating meningococcal septicæmia, is not a specific clinico-pathological entity. Unwarranted and exaggerated importance has been placed on the adrenal apoplexy as being one of the main causes of the symptoms of the syndrome.

Summary.

1. The clinical histories of 38 patients suffering from meningococcal septicæmia are reviewed.
2. Meningococcal septicæmia is a disease of protean clinical manifestations; all grades of severity, from fulminating to mild subclinical types, are encountered. The disease also may assume a suppurative role or run a chronic course.
3. Of seventeen patients suffering from fatal fulminating septicæmia, bilateral adrenal apoplexy was present in nine and absent from eight.
4. All the seventeen patients suffering from fulminating septicæmia presented typical clinical features of the Waterhouse-Friderichsen syndrome, and yet in eight of them no evidence of adrenal apoplexy was found at post-mortem examination.
5. Adrenal apoplexy appears hitherto to have been given unwarranted and exaggerated importance as the factor determining death and causing the symptoms of collapse in patients suffering from fulminating meningococcal septicæmia.
6. The Waterhouse-Friderichsen syndrome does not constitute a specific clinical entity; an identical clinical syndrome occurs in patients with fulminating meningococcal septicæmia without adrenal apoplexy. It follows,

therefore, that adrenal apoplexy cannot be diagnosed with certainty on clinical grounds.

7. There is sound reason to believe that adrenal apoplexy is merely a pathological incident in a fulminating septicæmia.

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THE ANTAGONISM BETWEEN PROCAINE AND THE SULPHONAMIDES.

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SINCE Woods⁽¹⁾ first showed that p-aminobenzoic acid and certain of its derivatives were able to inhibit *in vitro* the action of sulphanilamide against *Streptococcus hæmolyticus* and *Bacillus coli*, his work has been confirmed and extended by others. The anti-sulphanilamide action of p-aminobenzoic acid has been demonstrated by means of a variety of organisms with at least four of the sulphonamides. Landy and Wyeno⁽²⁾ showed that p-aminobenzoic acid could inhibit the action of sulphanilamide, sulphapyridine and sulphathiazole against strains of hæmolytic streptococcus, pneumococcus and staphylococcus respectively. Spink and Jerimista⁽³⁾ using only *Staphylococcus aureus*, showed that p-aminobenzoic acid could inhibit the action of sulphadiazine, in addition to the three first-mentioned drugs.

⁽¹⁾ Working with the aid of a grant from the National Health and Medical Research Council of Australia.

Particular interest attaches, however, to the inhibitory effect of the esters of *p*-aminobenzoic acid, since among these are many widely used local anæsthetic agents. Woods⁽¹²⁾ had shown that procaine (synonym "Novocain"), the β -diethylaminoethyl ester of *p*-aminobenzoic acid, could inhibit the action of sulphanilamide in as great a dilution as could *p*-aminobenzoic acid. Boroff *et alii*⁽¹³⁾ confirmed this, showing that concentrations of procaine, such as are found in aspirated pleural fluid after its use as a local anæsthetic agent, were able to inhibit the action of sulphanilamide on the pneumococcus. Finally, Kelch *et alii*⁽¹⁴⁾ using three different organisms, and sulphanilamide, sulphapyridine and sulphathiazole for their experiments, showed that at least seven of the esters of *p*-aminobenzoic acid which could be used as local anæsthetic agents exhibited various degrees of inhibition of the action of these drugs. They tried as controls in the same way a number of local anæsthetic agents with structures other than that of esters of *p*-aminobenzoic acid and found them inactive. The action against sulphonamides is therefore due to the *p*-aminobenzoic acid in the compound, and not to its local anæsthetic properties.

Selbie⁽¹⁵⁾ and McCarty⁽¹⁶⁾ have shown that *p*-aminobenzoic acid is able *in vivo* to inhibit the effect of the sulphonamides in experimental infections in mice. Hawking⁽¹⁷⁾ found that the application of procaine solution to experimental wounds in guinea-pigs, infected with *Clostridium welchii*, diminished but did not completely abolish the protective action of sulphathiazole dressings.

In order to evaluate the importance of these findings to human surgery, it is necessary to study the mode of action of these local anæsthetic agents against sulphonamides, their metabolic fate *in vivo*, and the results of further animal experiments in which local anæsthetic agents of the *p*-aminobenzoic acid class have been used at the same time as the sulphonamides in the treatment of experimental infections.

Experimental Investigation.

Analytical Methods.

Concentrations of procaine and *p*-aminobenzoic acid were determined by modifications of Marshall's method for the sulphonamides. Trichloroacetic acid solutions of the compounds were diazotised with sodium nitrite, the excess nitrous acid being destroyed by 1% urea solution. A 1% solution of dimethyl- α -naphthylamine in ethanol was added and the solutions were allowed to stand for one hour for maximum colour development before readings were made. In some experiments a 1% solution of urea containing in addition M sodium dihydrogen phosphate was used in order to shorten the time of maximum colour development, since Marshall and Litchfield⁽¹⁸⁾ have shown that the velocity of coupling is increased if the solutions are not too acid.

The dye formed on coupling was read in a Hilger-Nutting-Barfit spectrophotometer at 530 m μ . Little difference was found between the extinction coefficients of the two dyes; they were 28.6 for procaine and 29.0 for *p*-aminobenzoic acid at a concentration of $1 \cdot 10^{-4}$ molar in a one centimetre cell.

In order to estimate the two compounds in the presence of one another, use was made of the difference in basicity of their two azo dyes.

The *p*-aminobenzoic acid azo dye has one basic group, the dimethylamino-radical, and one acid group, the -COOH attached to the benzene nucleus. The procaine azo dye has two basic groups, a dimethylamino and a diethylamino group. The procaine azo dye is thus more strongly basic than the *p*-aminobenzoic acid dye. When the acid solution of the dye after the maximum colour has developed is buffered with sodium acetate, the dye may be taken into

ether. The ether is washed once with a few millilitres of water and then extracted three or four times with two millilitres of 0.5% of hydrochloric acid. This extracts the procaine azo dye. The ether is then extracted two or three times with two millilitres of 20% hydrochloric acid. This extracts the *p*-aminobenzoic acid azo dye. The concentration of the dye is then measured in the spectrophotometer. If the amount of dye with which the work is done is not too large, the method gives results reproducible to within 10%. The extinction coefficients given above for the two dyes were determined in this way. By treatment of standard solutions of *p*-aminobenzoic acid or procaine in the same way as the unknown the method can be adapted for ordinary colorimetry.

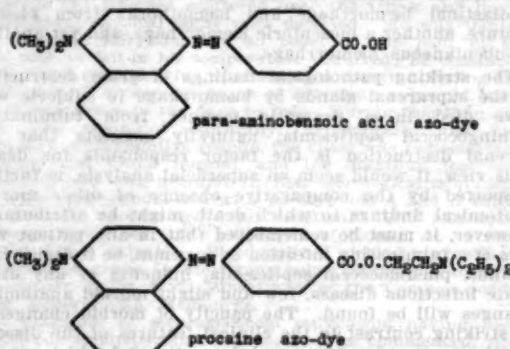


FIGURE I.

The determination of the extinction coefficient of *p*-acetylaminobenzoic acid is made in the above way after hydrolysis with 0.2 N hydrochloric acid at 100° C. for one hour. Unfortunately the extinction coefficient of acetylprocaine cannot be so determined, since the hydrolysis partially splits the ester linkage forming some *p*-aminobenzoic acid. While the extinction coefficients of the free compounds therefore can be determined separately, those of the acetyl compounds can only be determined together.

The determination in blood is made on an aliquot of the trichloroacetic acid filtrate from the blood after hemolysis in five volumes of 0.1% saponin. Other tissues are minced with scissors, ground with sand and extracted with trichloroacetic acid. While this procedure would extract the free amine, and any acetylprocaine (on account of the diethylamino group), it is doubtful whether it would extract all of the *p*-acetylaminobenzoic acid, which is less soluble.

Hydrolysis of Procaine by Blood.

When experiments were made with whole blood to estimate the recovery of added procaine and *p*-aminobenzoic acid, it was found that the procaine was rapidly hydrolysed to *p*-aminobenzoic acid by whole blood. The hydrolysis could be inhibited by physostigmine. The experiments were carried out as follows.

To 1.0 millilitre of saline solution, with or without 32 microgrammes of physostigmine, were added 0.5 millilitre of human oxalated blood and 0.472 micromole of procaine hydrochloride. The solutions were incubated at 35° C., and after varying periods of time the hydrolysis was stopped by the addition of trichloroacetic acid. The protein-free filtrates were then analysed as above for procaine and *p*-aminobenzoic acid.

The results are given in Table I.

Although physostigmine is well known as the inhibitor of acetylcholine esterase, Stedman and Stedman⁽¹⁹⁾ have shown that substituted urethanes inhibit the hydrolysis of other esters by the esterases present in serum. The inhibition by physostigmine, while showing the enzymic nature of the hydrolysis, cannot, therefore, indicate which esterase is responsible.

¹ Since both compounds are primary amines and since their azo dyes have almost identical absorption spectra, the evidence adduced by Rubbo *et alii*⁽¹²⁾ for the hydrolysis of procaine by *Clostridium acetobutylicum* is without foundation. This evidence was based on the appearance of a primary amine, which on diazotisation and coupling gives a colour similar to that obtained from *p*-aminobenzoic acid.

TABLE I.
Hydrolysis of Procaine by Blood.

	Control, Precipitated Immediately. No Physo- stigmine.	Hydrolysed for 50 Minutes. No Physo- stigmine.	Hydrolysed for 50 Minutes Physostigmine, 32 Micro- grammes.
Procaine added (micro- mole)	0.472	0.472	0.472
Procaine recovered (micro- mole)	0.312	0.058	0.283
p-aminobenzoic acid re- covered (micromole) ..	0.043	0.243	0.049
Percentage of procaine hydrolysed to p-amino- benzoic acid	12.0	81.0	15.0
Percentage of total pro- caine accounted for ..	75.0	84.0	71.0

Hydrolysis of Procaine by the Mouse.

While the enzyme system responsible for the hydrolysis of procaine is present in mouse blood as well as in human blood, it is not responsible for the greater part of the hydrolysis *in vivo*. Eggleston and Hatcher⁽⁴⁾ have shown that the liver is probably responsible for most of the "detoxication" of procaine *in vivo*. Certainly the liver is mainly responsible for the acetylation of free amino compounds.

In order to get an indication of the overall hydrolysis and acetylation, experiments were made on whole bodies of mice, after the injection of procaine. At various times after subcutaneous injection of procaine the mice were killed with coal gas, skinned, decapitated, cut up finely with scissors and ground in a mortar with acid-washed sand and 3% trichloroacetic acid solution. After the extraction had been allowed to proceed for fifteen minutes with occasional shaking, the extract was filtered and analysed for procaine, p-aminobenzoic acid and total acetylated amines. Some of the compounds were lost in the urine passed by the animals before they were killed, and the extraction with trichloroacetic acid cannot be relied upon to extract the acetylated derivatives very thoroughly. The figures given in Table II represent the amount of the compounds present in the acid extract.

From the figures in Table II can be appreciated the chemical processes at work detoxicating the procaine and eliminating the breakdown products. In addition to the excretion of unchanged procaine, the first step is its hydrolysis to p-aminobenzoic acid. If the procaine itself was acetylated faster than it was hydrolysed to p-aminobenzoic acid, no free p-aminobenzoic acid would be found. The second step is the acetylation of some of the p-aminobenzoic acid.

The concentration of procaine and p-aminobenzoic acid in the blood is low. In two rats receiving 20 milligrammes of procaine hydrochloride, no free amine could be detected in the blood after two hours, while the amount present at

one hour was too small for measurement, being less than five microgrammes of p-aminobenzoic acid.

From the point of view of the inhibition of the action of sulphonamides, there is no doubt that in the detoxication of procaine *in vivo* p-aminobenzoic acid is formed; the effect that this would have on any infection treated with the sulphonamides would depend on the relative rates of formation, acetylation and excretion of the p-aminobenzoic acid.

Species differences may be found in this process. According to Ambrose and Sherwin,⁽⁵⁾ the rabbit, mouse and man can acetylate p-aminobenzoic acid, while the dog cannot do so. Experiments by Ellinger and Hensel⁽⁶⁾ on acetylation of p-aminobenzoic acid in the rabbit show that three days may elapse before all the free p-aminobenzoic acid is excreted.

Procaine in Experimental Infections.

While the chemical data show that the danger of reversal of action of the effect of sulphonamides does exist, it cannot show how great that danger is. The experiments of Selbie⁽⁷⁾ and McCarty⁽⁸⁾ show that p-aminobenzoic acid can reverse the effect of sulphonamides; but the p-aminobenzoic acid was given to the mice that they used for a number of days, so that it was present in the animal in varying concentrations throughout the period when the sulphonamide was exerting its effect. If procaine is used on a patient being dosed with sulphonamides, it is not likely that it will be used on successive days, but rather for a period relatively short compared with the time in which the sulphonamide will be exerting its effect. For this reason, the experiments of these authors exaggerate the effect which might be expected from the p-aminobenzoic acid liberated from procaine.

Litchfield, White and Marshall,⁽⁹⁾ however, have shown that while among mice allowed to eat food containing sulphanilamide immediately after receiving 200 lethal doses of streptococci there was a mortality rate of only 1%, a delay of four hours before the drug was given raised the mortality rate to 50%. With such a heavy infection, therefore, procaine would only have to delay the action of the sulphonamide for four hours in order to increase the mortality.

In the only experiment so far reported on the action of procaine *in vivo* against sulphonamides, Hawking⁽¹⁰⁾ has found that two milligrammes of procaine can diminish the activity of sulphathiazole against *Clostridium welchii* in an experimental wound infection in guinea-pigs. His experimental details have not yet been fully reported.

A further difference between the experiments of Selbie⁽⁷⁾ and McCarty⁽⁸⁾ on the *in vivo* inhibition of the action of sulphonamides by p-aminobenzoic acid and the possible effect of procaine, lies in the route of administration. In these experiments the p-aminobenzoic acid was given orally, while in practice the procaine is given subcutaneously, intramuscularly or intrathecally.

For these reasons we investigated the effect of procaine, given subcutaneously, on the course of an experimental streptococcal infection in mice treated with sulphanilamide.

TABLE II.

Procaine Injected. (Micromoles.)	Time Before Analysis. (Minutes.)	Free Procaine Found. (Micromoles.)	Free p-amino- benzoic Acid Found. (Micromoles.)	p-aminobenzoic Acid. %		Acetylated Amine = (Hydrolysed Amine) - (p-aminobenzoic Acid + Procaine).	Total Procaine Accounted for.	
				p-aminobenzoic Acid + Procaine	%		Micromoles.	Percentage.
20.5 (5.2 milli- grammes)	15	1.07	1.05	50	1.02	3.74	18	
	15	1.31	1.02	44	0.64	2.97	15	
	30	1.58	—	—	—	2.96	15	
	30 ¹	0.83	1.13	52	0.38	2.34	13	
	60	0.64	1.43	69	0.35	2.40	12	
	60	0.36	0.72	67	0.41	1.59	7	
	120	0.16	0.28	61	0.54	0.96	5	
30.5 (10.0 milli- grammes)	120	0.34	0.24	41	Not estimated.			
	120	0.37	0.22	37				
	120	1.0	0.86	47				

¹ Animal died 30 minutes after injection.

In order to estimate the largest dose of procaine that could be used without directly causing an appreciable mortality among the mice, the dosage-mortality curve for procaine was calculated by the method of Bliss.⁽²⁾ The earlier figures for the minimum lethal dose of procaine in mice, given by Hirschfelder and Bieler,⁽³⁾ were of no use for this purpose.

Forty-two mice were injected with increasing doses of procaine hydrochloride, the dosage-mortality relation being given by the equation:

$$Y = -1.6962 + 10.0629 X$$

(X^2 test for goodness of fit giving P between 0.5 and 0.7), where Y is the mortality in probits, and X is \log_{10} (10 dose milligramme per gramme). From this equation a dose of 0.273 milligramme of procaine hydrochloride per gramme of body weight will kill only 1% of the mice. The mice used weighed about 30 grammes; the dose given was 5.2 milligrammes of procaine hydrochloride, a little below the dose which would kill 1% of the mice.

Streptococcus R 18, of group A (Lancefield), type 18 (Griffiths), was used to infect the mice. Dilutions were made of eighteen to twenty-four hour broth cultures and injected intraperitoneally.

The sulphanilamide was incorporated in the food given to the mice in a concentration of 0.5%.

In the first experiment 180 mice were taken in three groups of 60. One group was given a subcutaneous injection of 0.28 millilitre of isotonic saline solution and food without sulphanilamide. The second group was given a similar injection of saline solution and food containing sulphanilamide. The third group was given subcutaneously 0.28 millilitre of a 2% solution of procaine hydrochloride and food containing sulphanilamide. Within each group of 60 mice six different dilutions of the streptococcus were injected intraperitoneally into each of the ten mice in the subgroup. The results of this experiment are given in Table III.

TABLE III.

Proportion of Survivors After Four Days.

Number of Streptococci Given.	Treatment.		
	Saline Solution Alone.	Saline Solution, Sulphanilamide.	Procaine, Sulphanilamide.
250 million	0/10	1/10	0/10
12.5 million	2/10	8/10	7/10
1.25 million	8/10	10/10	8/10
125 thousand	5/10	10/10	8/10
12.5 thousand	8/10	9/10	9/10
1.25 thousand	5/10	10/10	9/10
0.125 thousand	6/10		

¹ One animal was killed during infection in these groups.

In both experiments in which sulphanilamide was given in the diet the mortality rate was significantly less than in the control group of mice; this showed that the organism used was sensitive to sulphanilamide. Although of the mice which were given procaine and sulphanilamide fewer survived than of those given sulphanilamide alone, this difference was not significant.

In addition, it was realized when the experiment had been commenced that allowance had not been made for the transient symptoms of procaine intoxication which the mice showed. The mice that had been given procaine started eating their food later than the mice that had been given saline solution. This would tend to make the mortality rate in the procaine group greater, not because of the *p*-aminobenzoic acid liberated from the procaine, but because of the delay in the ingestion of sulphanilamide.

A further experiment showed that the data could be interpreted in this way. Five groups of mice were injected intraperitoneally with broth containing 1.250 streptococci. They were allowed to eat the sulphanilamide diet after various intervals of time—in all cases less than the four hour delay which was used in the experiments reported by Litchfield, White and Marshall.⁽⁴⁾ The results are shown in Table IV.

TABLE IV.

Treatment After Infection.	Proportion Surviving Four Days.
No sulphanilamide	5/10
Sulphanilamide diet fed:	
After 120 minutes	5/10
After 60 minutes	5/10
After 40 minutes	8/10
After 0 minute	9/9

Any differences found in the first experiment could be accounted for by the delay in eating the drug caused by the injection of procaine.

To overcome this a third experiment was carried out in which the mice were fed on the drug diet for twenty-four hours before they were infected. Smaller mice were used, and the dosage of procaine was smaller, being only 0.2 millilitre of a 2% solution of procaine hydrochloride. This dosage was that which would kill 0.5% of the mice. Three dilutions of the organism were used. No control injections of saline solution were made. Table V shows the result of the experiment. While there were fewer survivors among the mice treated with procaine, the difference was not significant statistically, the odds against its being due to chance being only about four to one. Greater numbers of mice would be necessary before such differences could be considered significant.

TABLE V.
Proportion of Survivors after Twenty-seven Hours.

Number of Streptococci (Millions).	Sulphanilamide Alone.	Sulphanilamide plus Procaine.
15.0	1/8	0/7
1.5	2/8	1/8
0.15	8/8	3/7

Discussion.

The study of the *in vitro* inhibition of the action of the sulphonamides by *p*-aminobenzoic acid has given values for the molar inhibition (moles sulphonamide inhibited by moles *p*-aminobenzoic acid) ranging from 25,000 to 10, according to the different conditions of the experiments. The media used in these experiments were all simpler than the body fluids. The values for the molar inhibition found in experiments *in vivo*, in which the death of the animal is taken as the end point, were 8 and 13. Since there may be other anti-sulphonamides besides *p*-aminobenzoic acid, and since the sulphonamides are not the only defence mechanism active against invading organisms, a knowledge of the relative concentrations of *p*-aminobenzoic acid and the sulphonamide in an infected tissue cannot determine the outcome of the infection.

Determination of the bactericidal power of the body fluids after both dosing with sulphonamide and injection of procaine would permit a smaller degree of inhibition of the sulphonamides to be observed than would be shown by the use of mortality rates as an index of inhibition. Strauss and Finland⁽⁵⁾ have given *p*-aminobenzoic acid to patients being treated with sulphonamides in an endeavour to diminish the toxic effects of the sulphonamide. The *p*-aminobenzoic acid was given after the original infection had been brought under control. No patients died from a recurrence of the infection. While the *p*-aminobenzoic acid had no effect on the toxic symptoms due to the sulphonamide, it stopped the bactericidal action of the sulphonamide in blood cultures from the patient. The doses of *p*-aminobenzoic acid given in these experiments were much greater than would be formed *in vivo* from the use of procaine. In one case the amount of *p*-aminobenzoic acid given was equivalent to 52 grammes of procaine. The results, therefore, are not applicable to the problem as met with in practice.

On the basis of his experiments with procaine in the treatment of experimental infections with *Clostridium welchii* in guinea-pigs, Hawking⁽⁷⁾ has suggested that local anæsthetic agents of the p-aminobenzoic acid class should not be used in surgery unless it is certain that sulphonamides will not be used within the following twenty-four hours.

Until further work gives a more precise answer to the problem, the experiments reported here suggest that only in a few conditions would the danger from procaine and other local anæsthetic agents of the p-aminobenzoic acid class be so great as to contraindicate their use. They are contraindicated (i) when the patient is so seriously infected that even a slight delay in treatment with sulphonamides may diminish the chances of survival, and (ii), when massive tissue damage is present, and the circulation in the damaged tissue is poor, so that the removal of p-aminobenzoic acid from the tissue after the use of procaine may be very slow. This might enable a wound infection, which would otherwise perhaps have been kept in check with the sulphonamide, to become established.

Summary.

A method is given for the estimation of procaine and p-aminobenzoic acid in the presence of one another. By this method it is shown that procaine is hydrolysed to p-aminobenzoic acid by an esterase present in human blood. In the mouse, injected procaine is hydrolysed to p-aminobenzoic acid, some of which is then acetylated to p-acetylaminobenzoic acid. Among mice which had been infected with a streptococcus and were being treated with sulphanilamide, the injection of procaine caused a slight increase in the mortality rate. Under conditions of very severe infection, or when massive tissue damage has occurred, it is suggested that procaine or other local anæsthetic agents of this class are contraindicated if any of the sulphonamide drugs are being used.

Acknowledgement.

The writers are indebted to Dr. H. Wilson, of the Commonwealth Serum Laboratories, for a culture of the streptococcus used in this work.

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¹ The following is a list of the local anæsthetic agents classified according to their chemical constitution (Hawking⁽⁷⁾).

A: Those which contain the p-aminobenzoic acid group and presumably inhibit the action of sulphonamides: procaine ("Novocain", "Planocaine"), "Larocaine", "Tutocaine", "Butyn", "Anæsthesin", "Orthoform".

B: Those which do not contain this group and presumably do not inhibit the action of sulphonamides: cocaine, tropacocaine, eucaine (bensamine), "Stovaine", "Percaïne", ("Nupercaine"), phenacaine, "Pantocain", "picaïne", "eacaine", "Alypin", "Apothesin", "Diothane", "Metycaine".

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Reviews.

THE MAYO BROTHERS.

"To Rochester? This way, Ma'am. There is a special bus for Rochester." Thus on a mid-summer morning a redcap in the Minneapolis Bus Station directs the traveller, who finds not one special bus but two loading with passengers for Rochester. This is the first paragraph of Helen Clapesattle's "The Doctor Mayo".

In Mayo Park, Rochester, stands the statue of a man whom the inscription identifies as "William Worrall Mayo, Pioneer, Physician, Citizen. A Man of Hope and Forward Looking Mind." He also happened to be the father of the two more widely known Mayos, Dr. Will and Dr. Charlie.

William Worrall Mayo commenced practice in Rochester in January, 1864, in just the way that many doctors had commenced practice before that time and many since. The author tells us that on December 14, 1880, William Worrall Mayo first removed a large ovarian cyst. "Young Will and Charlie were there too, peeping through the door."

The brothers Mayo graduated about 1883, at the time when modern aseptic surgery was born, and they commenced practice in association with their father. At first it was an ordinary father and son's practice.

One of the most powerful precepts "the old doctor" gave his sons was that: "No man is big enough to be independent of others." This yardstick was fundamental in the growth of the Mayo Clinic, so that once a man was chosen to commence a new department, he was free to develop it as he thought best, as long as he was a good team man and fitted into the cooperative plan of private practice. As the story is unfolded the reader begins to see what made the Mayo Clinic possible. Its home, Rochester, was a small country town undefiled by the meannesses of a large city; it was the market centre of Olmstead County, one of the richest agricultural counties in the United States, flourishing in the production of cattle, pigs, sheep, butter, flour and small grains. Later it came to be served by two railway systems, for "it would have taken a greater attraction than even the Mayos possessed to build more than a local medical practice on the motive power of horse flesh moving over narrow rutted wagon roads. . . . When the Mayos were ready for expansion beyond the radius of team and wagon travel, the rails were ready to provide transportation to carry the surgeons out and the patients in." Another factor in its success was the time of its foundation, at the very beginning of aseptic surgery. As Dr. Will was accustomed

"The Doctors Mayo", by H. B. Clapesattle; 1941. Minneapolis: The University of Minnesota Press. Medium 8vo, pp. 836, with 64 illustrations. Price: \$3.75.

to say modestly but withal not without some truth: "As I look back over the early years I am impressed with the fact that much of our success, if not most of it, was due to the time at which we entered medicine."

"People at times advised them to leave Rochester and transfer their labours to some big city where they would have more scope for their abilities. But the brothers were never tempted. They had become too firmly established in and attached to Rochester and Dr. Will was of the opinion that they could not have won the reputation they had if they had been lost in a crowd of surgeons in a large city."

The brothers had at an early period of their professional life adopted the habit of travelling to learn new methods, and this habit made Rochester "an almost automatic clearing house for the best work of the world's hospitals".

Another important factor in the development of the Mayo Clinic were the Sisters of Saint Francis; one of these, Sister Joseph, was an exceptional woman, highly intelligent, spirited and positive in personality. She was a native of Rochester and Dr. Will was wont to describe her as "the best assistant I ever had".

But site and time might well have been barren if living men and women able to grasp the exceptional opportunity had not been present; fortunately they were—three men, a father and two sons with vision, courage, determination, ability and skill beyond the average; two women, loyal, generous and helpful wives of their world-famous husbands, and one other a great brave-hearted American pioneer woman—their mother. "A woman of tolerance, understanding and equanimity." These, together with a group of loyal assistants, small at first but later numbering hundreds, have carved for the name of Mayo an important niche in the history of surgery, and perhaps, if the clinic succeeds and thrives now that its founders are gone, in the history of the world.

All this is told in a very interesting book which will serve both to delight and instruct the reader. Powerful as the picture "The Covered Waggon" was in its portrayal of the lot of the American pioneer, this book with equal clarity reminds us of the difficult path trod by the Mayos and the master they were proud to serve—surgery.

MOTHERCRAFT.

"THE AUSTRALIAN MOTHERCRAFT BOOK" consists of a series of articles by various authors written to fulfil the need in all sections of the community for information concerning the care of infants and young children.¹

The selection of subjects presents a useful survey of the problems which will confront the mother from the early days of her pregnancy. The attention which is drawn to the overwhelming advantages of the natural feeding of the baby, is well timed in days when the propaganda supporting the use of dried milks is so lavishly used by manufacturers. This simply set out and emphatic statement should encourage mothers to breast feed their babies and to realize that even if artificial feeding can be successfully adapted to the needs of the baby, it cannot provide the advantages of natural feeding.

The chapter on the care of the premature infant is most important. The instruction given should enable mothers, who are far distant from expert help, to manage these babies properly. Many lives are lost from lack of correct understanding of the necessity for extreme care in handling premature babies and the need for warmth.

The inclusion of chapters on the care of the skin and eyes will be found useful. The relative significance of the symptoms affecting the ear, nose and throat is most necessary as a guide to mothers, particularly the reference to ear-ache.

The description of common symptoms with simple statements of their cause and effect will give reassurance to many.

The chapters devoted to the older child are short descriptions of salient features in growth, development, feeding and management. They indicate to the mother the wide field of intelligent guidance in childhood, and the importance of understanding the trends of development and the indications for further investigation and treatment.

¹"The Australian Mothercraft Book", by various authors, edited by Marie Brown, M.B., B.S. (London), D.P.H. (Sheffield), Constance Finlayson, M.B., B.S. (Melbourne), and Helen M. Mayo, O.B.E., M.D. (Adelaide); published for the Mothers and Babies Health Association of South Australia; Second Edition: 1942. Adelaide: Rigby Limited. Crown 8vo, pp. 269, with illustrations. Price: 2s. 6d. net.

The care of the expectant mother briefly describes personal hygiene and diet and signs and symptoms which are to be regarded as serious.

The chapters on posture, rest and exercise include a short description of the recent advance in obstetric practice of pre-natal and post-natal exercises. These are proving beneficial to mothers in the prevention of many minor maladies and in the reestablishment of muscle tone and posture after confinement.

This book may be well recommended to all those interested in mothercraft and infant care.

THE FIFTH ADDENDUM TO THE BRITISH PHARMACOPŒIA, 1932.

THE Fifth Addendum to the British Pharmacopœia, 1932, which became official in Great Britain in May, 1942, is, in the main, a wartime measure of economy and expediency.¹

The employment of alcohol is reduced to a minimum by the provision of concentrated preparations to be used as alternatives to the corresponding preparations which were hitherto in common use. These include a number of concentrated tinctures, aqueous emulsions of chloroform and of peppermint oil to replace the corresponding "spiritus" and liquid extracts of quillaja and of squill in lieu of the tinctures.

Of the concentrated tinctures, those of orange, lemon and quassia, the compound tinctures of cardamon, cinchona and gentian, and the ammoniated tincture of valerian are approximately four times the strength of the unconcentrated preparations and their doses are quoted, in proportionate reduction, as 8 to 15 minims (0.5 to 1.0 ml). A similar concentration of tinctures of capsium and lobelia bring their maximum dose to 4 minims (0.25 ml), while an eight times concentrate of camphorated tincture of opium gives a dose range of 4 to 8 minims (0.25 to 0.5 ml).

The emulsions of chloroform and of peppermint oil have the same strengths and doses as the corresponding spirits.

A liquid extract of squill (dose, half to three minims) is approximately ten times the strength of the tincture and in its preparation the use of Indian squill (*Urginea indica*) is sanctioned.

The somewhat outmoded sweet spirit of nitre is replaced by a concentrated solution of ethyl nitrite (2 to 8 minims) having an ethyl nitrite content of 17% to 20% weight/volume when fresh.

Aromatic spirit of ammonia is replaced by an aqueous solution—*Liquor Ammonia Aromaticus*—having the same dose and equivalence in ammonia and ammonium carbonate, but with a necessary reduction in the sparingly soluble oils of lemon and nutmeg.

Because of difficulties in obtaining supplies of *Atropa Belladonna* from pre-war European sources, the use of the Indian variety, *Atropa lutescens*, is sanctioned, both leaf and root being described in appropriate monographs. The minimum alkaloidal standards allowed for these are lower than those of the leaf and root of the *Atropa Belladonna*, being not less than 0.15% and 0.25% respectively. This notwithstanding, in amended monographs dealing with the powdered leaf, liquid extract, liniment and tincture of belladonna, no change has been made in the alkaloidal strengths of these galenicals. No concentrated tincture of belladonna is provided.

A further direction is given with regard to the sterilization of a solution of digoxin. As alcohol, 70%, is used as a solvent, it is directed that sterilization in an autoclave be effected in a container sealed by fusion of the glass, and that the solution be not opened until it has cooled to room temperature.

Four varieties of menthol are authorized for medicinal use—*levo* menthol (natural and synthetic), racemic menthol, and any mixture of stereoisomers of *p*-menthan-3-ol. The last-named mixture of stereoisomers allows of a wider fractionation product being used with a corresponding increase in the total output.

Mepacrine methanesulphonate, introduced in the Third Addendum, is more accurately defined and directions for the preparation of a sterile solution for parenteral injection are given—this being effected by dissolving it in the requisite amount of sterilized water immediately before use.

A cumulative index to all the addenda is a timely and useful inclusion.

¹"Fifth Addendum to the British Pharmacopœia, 1932" published under the direction of the General Council of Medical Education and Registration of the United Kingdom: 1942. London: Constable and Company Limited. Medium 8vo, pp. 52.

The Medical Journal of Australia

SATURDAY, DECEMBER 26, 1942.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: Initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

THE MEDICINE OF TOMORROW.

In a recent issue of this journal the attention of readers was directed to an address on reconstruction in the practice of medicine by Sir Farquhar Buzzard, Regius Professor of Medicine in the University of Oxford. On that occasion the view was stated that members of the Australian Branches of the British Medical Association should be made acquainted with any important contributions to medical literature which might have a direct or indirect bearing on the subject of reconstruction. It may possibly be objected that frequent reference to this subject is wearisome. Perhaps it is, but we nevertheless propose to continue the exposition of the views of prominent writers abroad. As the weeks pass Australian citizens are not allowed to forget the problems of post-war reconstruction. The politicians are insistent on them and the newspapers reflect the political trend, and although according to our own political leanings we may each interpret for ourselves the motives of parliamentarians, we must, unless we are completely foolish, be prepared to face the issues. It must by this time be obvious that one of the first steps in reconstruction in Australia will be concerned with the inauguration for the community of a medical service that will cover both the prevention and the treatment of disease. The medical profession agrees wholeheartedly that such a service is required, but—and this statement cannot be repeated too often—it knows and will continue to declare that a planned medical service cannot remove disease from the community unless something is done about conditions of housing, of work and of leisure. These conditions are the immediate concern of parliamentarians; they have a place in the medical practitioner's study of social medicine, but this place is incidental to that of disease itself.

The latest discussion on the future of medicine comes from the University of Aberdeen where R. S. Aitken, Regius Professor of Medicine, delivered a presidential address to the Students' Medical Society.¹ There is not a great deal in this address that is essentially new, but the arguments are presented in an attractive way and in language which must have held the attention of the student audience. Aitken starts his address by showing that medicine is a living thing. All living things must grow and change and adapt themselves to their environment. The environment of medicine, society, is changing and medicine must change too. In a discussion on the overgrowth of specialization Aitken advances three causes for the phenomenon; two of them are well known, the third is not so commonly recognized. The first is the advance of knowledge and technique in medicine to such a stage that no one man can master and develop more than one field in a lifetime. The second cause is implicit in the easier life, more regular hours and higher fees earned in specialist than in general practice. The third cause is the development of the State specialist services. Here we may consider the school medical services, the baby health centres, venereal disease services, tuberculosis dispensaries and sanatoria, child welfare and maternity clinics and so on. Probably specialization became necessary in each of the spheres of activity mentioned for different reasons. In some of them it probably never occurred to anyone in the early days that the private practitioner might be at all concerned; in others probably State action was necessary. These services came into being when the idea of preventive medicine was beginning to send out shoots and to force itself upon public attention. Preventive medicine has made advances and demands on the time of medical practitioners and this will continue. Aitken's explanation of the growth of the State services that have been mentioned is that the voluntary hospital system and the general practitioner system failed to meet the needs of the people. "They did not come into being because the work involved was so difficult as to require special ability or training; it was simply that doctors had to be paid salaries to work in these special fields because the independent practitioners were not doing the work." Whether Aitken's is the full explanation does not really matter; the point is that the practice of medicine had to undergo certain changes to meet a new demand. Let us turn now to the social environment of medicine and to its changing state. Aitken writes: "Last century was the heyday of free trade: buy in the cheapest market, sell in the dearest; never mind who suffers, so long as the dividends are high; fight with your competitors, undersell them, buy them up; judge your success by your balance-sheet. These were the orders of the day, and they worked pretty well for a time. But when international competition pressed hard on us, when slumps came, the ruthlessness of unrestrained commercialism gave us millions of unemployed and our cancerous depressed areas. Under that system we distributed the profits of trade unequally, and the losses with cruel unfairness. But at the same time the notion was growing that services rendered are more important than profits gained." This short story might justifiably be told in stronger language, but it may be allowed to pass as it stands. There are fortunately many persons who would rejoice to be able to

¹ The Lancet, August 29, 1942.

believe that the idea of service before profit had gained wide acceptance. But even if the acceptance at present cannot be called wide, the idea is gaining ground. Aitken points out that in war the needs and the safety of all the people are paramount; and he holds that when peace comes the lesson will not be forgotten and that in many activities national control in some form will persist. The change coming over society is, he thinks, fundamentally due to the impact of applied science on human life, and for this reason it is an inevitable change and there is no sense in opposing it. There is, however, every need to mould the form and direction that it takes, for this may be either "the squalid hell of the totalitarian anti-heap" or the form of democracy after which we are striving; Now we may turn to medicine which, Aitken declares, has much in common with commerce. "A doctor's services were his stock-in-trade which he sold to the highest bidder. He would always prefer a practice in a good-class area to one in a poor area, if he thought he could make it. . . . He could hardly help giving more time and attention to his private patients who paid fees than to his panel patients. He could hardly help being more interested in Johnnie Anderson's acute appendicitis, which called for a dramatic and expensive operation, than in Tommie Davidson's nocturnal enuresis, which required a series of interviews with Tommie's terrifying mother." Here Aitken makes a remark of a kind often heard in this country: the doctor's work owes much to the stimulus of fees and competition, but in many ways it is hindered by the fact that he is selling his medicine in the market, not giving it to those who most need it. What he means here is no doubt the "fee per visit" basis of private practice, because a doctor "sells his medicine" whether he treats patients on a fee-per-visit basis or in virtue of a salary received as a member of a service. Tomorrow, Aitken adds, a nation-wide organization will be sought; it will be aimed at a nation-wide medical service, free from commercial competition. He is one of those who think that irresistible social and economic forces will bring this about, and he holds, as do others, that we have it in our power as a profession to design the organization and to design it well.

The responsibility of the medical profession in the matter of organization, emphasised by Aitken, has been urged in this journal on many occasions, it has been the subject of discussions and addresses, and it has been proclaimed by our own Federal Council—and not only proclaimed but advanced as a subject for action at the present time. Aitken asks two questions in regard to this organization: "What shall we keep?" "How shall we keep it?" In answer to the first of these questions he names two tenets of medical tradition which belong to the very heart of it and have contributed to the nobility of the profession at its best. He insists that we should struggle to preserve them in the new organization. The first is that medicine gives highest place to the value of the human individual, not to the factory or the town or the State. This subject was covered in these pages a week or two ago and need not be further pursued at present. Aitken's second tenet he describes as really an application of the first. It is that the doctor shall have liberty. "He should be free to seek the job in medicine that draws the best out of him, to put his best in the way of effort and enterprise into his work." Aitken thinks that the doctor's liberty, "like all democratic liberty", should be limited only by the one

restriction—that his exercise of it shall not do wanton harm to someone else. In our own discussion on the individual we insisted on the complete freedom of the individual with the proviso that this freedom did not react with disadvantage on the family or herd of which the individual was a member; since it is the community as such that will be likely to have great influence in the future, this would appear to be the better way of expressing this idea. In answer to his second question, "How shall we keep it?", Aitken points out first that a service based on the old-fashioned army model could be made to work like a beautifully designed machine, or an automatic telephone exchange, but it "would be blind to the individuality of patients, and would tend to treat all those bearing the same diagnostic label in exactly the same way". He thinks that in such a service many doctors would flag in their interest and lose their drive. It must be pointed out that there are quite a number who will differ from Aitken on this point, but all will agree that a medical service composed of men who lack interest and have lost their drive would indeed be a "poor thing". Aitken asks whether as an alternative to this lack-interest, lost-drive service it is possible to picture "an alternative, where within the frame-work of a nation-wide organization and under efficient general direction doctors can keep their true liberty and the welfare of the individual patient can remain the guiding aim". He suggests that the model on which such an organization could be built is the mammalian body. It has a central direction in the brain, but the brain receives a constant stream of impulses from the whole body—"information about the outside world, its opportunities and its dangers, news about this and demands for that from the body's various parts". This model Aitken thinks would be excellent for the future medical organization "in which we want the individual doctors, and the little groups of doctors working in group practices, in hospitals, in local health services, to have the maximum possible of responsibility, both for their own work, and for the policy of the institution in which they work, all under a tolerant and stimulating general direction".

It would be safe to conclude that the vast majority of those who are prepared to visualize a State medical service will agree with Aitken's general propositions. If a State medical service had to be initiated in Australia, some such general basis would receive assent. To plan a service with general direction and the kind of individual freedom set out by Aitken would be difficult. If the direction was "tolerant and stimulating", success would depend on the will of the participants to succeed. Unfortunately Aitken does not attempt the "detailed anatomy" of his medical service. Did he do so, we might picture it in this country after it was adapted to our needs. The qualifications enumerated by him for participants in such a service, in addition to reasonable intelligence, honesty and ability to work hard, include the faculty of getting on with people, enterprise and ingenuity and the possession of an ideal. For the ideal he suggests: "to secure better health, physical and mental, for every man, woman and child in the country". After all Aitken's address was for students. His words to practitioners thinking about a general health service for the community would probably be even more direct than those addressed to his students. As it is, the address contains ideas that should be of help to the "planners in plenty" around us.

Current Comment.

TUBERCULOSIS OF BONES AND JOINTS.

IN the opening sentence of a paper on the prognosis in bone and joint tuberculosis, R. I. Harris and H. S. Coulthard¹ ask: "What result may be expected from treatment of tuberculous bones and joints?" They try to answer this question by analysing the results obtained over a ten-year period in the treatment of 307 patients suffering from tuberculosis of the bones and joints, 296 of whom they have been able to follow up for periods varying from one to ten years. They point out that tuberculosis of bones and joints is a disease easy to alleviate, but hard to cure, and add that the achievement of cure is profoundly influenced by a variety of ancillary factors. Many persons doubt whether the word "cure" should be used in regard to tuberculosis, holding that the disease is arrested and not cured. Indeed it has been held that no one can be said to be cured of tuberculosis until he is safely dead of some other disease. If by cure we mean a return to normal structure and function, then tuberculosis will rarely, if ever, be cured. These considerations are perhaps incidental to the report which Harris and Coulthard write from the Toronto Hospital for the Treatment of Tuberculosis.

Only twenty-five of the patients discussed by Harris and Coulthard were under the age of twelve years. The majority fell into the age group between fifteen and forty-five years. In 70% of the cases the aetiology was determined by bacteriological means; in the remainder diagnosis was based on a consideration of skiagrams, of the history and of the results of clinical examination. It is important to note that not one case of bovine tuberculosis was discovered in the whole series. Bone and joint tuberculosis is generally regarded as being more often due to human tuberculosis. Wakeley and Buxton state that in children under ten years of age 67% of tuberculous bone and joint infections are due to the human bacillus and 33% to the bovine; in persons over ten years of age 93% are due to the human bacillus and 7% to the bovine type; for all ages the figures are 80% and 20%. A. S. Griffith is quoted by Illingworth and Dick as stating that the bovine type is present in 42.8% of cases in Scotland and that in England the figure is 18%. It would be interesting to have some Australian figures on this point. Of the factors influencing prognosis, two are regarded by Harris and Coulthard as having been of major importance in their series. These are the presence of multiple foci of tuberculosis in the body and the presence in any of these foci of organisms other than tubercle bacilli. Harris and Coulthard insist that patients suffering from tuberculosis of bones and joints are the subjects of disseminated tuberculosis to a greater degree than is generally suspected. There is a danger that surgically minded clinicians may regard a tuberculous bone or joint lesion as being an isolated focus and direct their treatment to that focus alone. If this is so—and text-books do not appear to lay sufficient stress on the point—Harris and Coulthard make a useful observation when they point out that in over 20% of the 296 patients under consideration tuberculosis was found in the genito-urinary system; tuberculosis was found elsewhere in the skeleton in 25% and in the lungs in over 40%. In the 59% of cases in which no radiological evidence of tuberculosis was found in the lungs, the bone lesions are regarded as having been the result of chronic dissemination through lymph channels and blood vessels, associated with a primary lesion which remained active for a period of time, but ultimately healed. It is probable, we are told, that the bone lesions in most of the remaining 40% were also laid down in a similar manner, "but a few seem to have arisen late in the course of the disease, from an actively spreading phthisis which dominated the picture". Harris and Coulthard's observations on secondary infection are interesting. They record the observation that uncontaminated tuberculous abscesses need not be a source of anxiety, so long as the bone lesion

is under adequate treatment by immobilization, because the abscess will subside with the regression of the bone lesion. In the hospital from which they write it is the custom to aspirate all abscesses in order to relieve symptoms of pressure, to prevent spontaneous rupture through the skin or to obtain material for the diagnosis. In the process a "stringent aseptic technique" is used. Abscesses are aspirated at suitable intervals until pus can no longer be obtained. Apparently this method of treatment is always successful, for Harris and Coulthard add that from time to time patients are admitted to hospital with running sinuses, originating in bones and joints and already contaminated with staphylococci, streptococci or other secondary organisms. Among fifty-six patients suffering from Pott's disease and "free from tuberculosis elsewhere in the body" there was a mortality of 13%. (There is nothing to show why a percentage is used in connexion with such a small number, and the only possible conclusion is that these authors wish their isolated observation to have a general application.) All the patients who died had secondary infections and all but one died as a direct result of the secondary infection. The lesson from this observation is obvious. It might be suggested that chemotherapy would overcome the secondary infection, but Harris and Coulthard found, and others in similar circumstances would probably find, that such degenerative changes were present as a result of chronic suppuration and that treatment by drugs of the sulphanilamide group could not be tolerated.

The only other aspect of this paper to which attention will be drawn is the section in which the 40% of patients with tuberculosis of the lungs are discussed. It was found that when tuberculous involvement of the lungs was present as a complication and as associated with other skeletal and renal foci, the prognosis was very much worse than when the pulmonary involvement was the only complication. The figures need not be given, but it may be noted that the chief causes of the rise in the mortality rates were military tuberculosis, meningitis and the pulmonary condition. Readers will agree that the very adverse effect of pulmonary tuberculosis in tuberculosis of the bones and joints should serve as an incentive for the search for and early treatment of pulmonary involvement. Indeed early diagnosis and a realization that bone tuberculosis is part of a general infection are the lessons to be learned from Harris and Coulthard's paper. To this may be added the problem of "cure".

THREE PRIMARY SYPHILITIC LESIONS IN ONE PERSON.

J. R. HERMAN reports the occurrence of three primary syphilitic lesions in one person during a ten-year period.² At the outset he quotes a statement by J. H. Stokes that most of the available evidence of reinfection in syphilis must rank as presumptive or suggestive rather than conclusive. The first infection occurred in 1932 when the patient, a white man, aged twenty years, had a primary coronal lesion. Dark field examination at the time gave negative results, but a "++++" reaction was given to the Kahn test. The lesion disappeared on intensive treatment. The patient was serologically examined at regular intervals until 1938. He then acquired a coronal sulcus lesion. Dark field examination revealed the presence of *Treponema pallidum* and the reaction to the Kahn test was "++++". Again the lesion disappeared after treatment. The third lesion appeared in 1942. The primary lesion became ulcerated and dark field examination revealed *Treponema pallidum*. Again a "++++" reaction to the Kahn test was obtained. The lesion disappeared on treatment. For the first time in the patient's venereal career an examination of the cerebro-spinal fluid was made, but no reaction was obtained. As Herman points out, the fact that all the lesions were penile is in favour of monorecurrence relapsing infection, rather than reinfection. This is true, but all the same the case should be noted for future reference.

¹ The Journal of Bone and Joint Surgery, April, 1942.

² The Journal of the American Medical Association, September 26, 1942.

Abstracts from Medical Literature.

OPHTHALMOLOGY.

An Unusual Form of Conjunctivitis.

E. F. KING (*The British Journal of Ophthalmology*, October, 1942) reports four cases of conjunctivitis which showed certain features that in the opinion of the author warrant the grouping of the cases as examples of a clinical entity. The pathogenesis is obscure. The author describes the clinical features common to the four cases. On preliminary examination slight ptosis was seen, together with a boggy fullness of the skin of both upper and lower lids. The eye tended to water and to be photophobic, but in general discharge was scanty, except during periods of secondary infection. The infection of the conjunctiva was largely confined to the posterior surface of the lids and the fornices, particularly the lower, and to the region of the plica and caruncle. This distribution of the hyperemia was in striking contrast to the relative whiteness of the ocular conjunctiva. The whole conjunctiva was somewhat edematous and there was a diffuse milkiness, particularly in the lower fornix, reminiscent of spring catarrh, and presumably the result of epithelial hyperplasia. In the upper fornix were a few scattered follicles. In the two more severe cases subconjunctival fibrosis developed in the lower fornix, leading subsequently in one instance to pronounced contraction. In two cases the cornea remained unaffected. In the other two a diffuse superficial keratitis was seen, extending over the greater part of the cornea; superficial vascularisation occurred and the whole picture was very like a diffuse phlyctenular keratitis of children. In each case the condition remained entirely unilateral. The condition was persistent and chronic. The author discusses in the differential diagnosis: an allergic conjunctivitis; a specific inflammation, such as syphilis or tuberculous; Parinaud's oculo-glandular syndrome; and nutritional disturbances. Biopsy of the conjunctiva revealed changes attributable to a non-specific, subacute inflammatory process. Such differences as were observed in the cases were differences of degree rather than of kind.

Ocular Changes in Diabetes.

C. S. O'BRIEN AND J. H. ALLEN (*The Journal of the American Medical Association*, September 19, 1942) have studied the ocular fundi of 555 young patients suffering from diabetes mellitus. Among this number they found 23 who manifested some pathological change in the retina which was apparently due to the diabetes alone. In an additional survey of 260 young diabetic patients, 43 were found to have lens changes of the type known to occur with this disease. The incidence of the retinal changes was 4%. In most of the cases the retinal lesions consisted of hemorrhages and degenerative areas, similar to those found in older patients. (All the patients with retinal changes were under thirty-one years of age.) The hemorrhages were usually punctate, but occasionally they were of the small striate variety. Small, hard, waxy, yellowish-white

areas of degeneration were seen in the central portion of the fundus in ten cases and cotton wool patches were observed along the course of the temporal vessels in seven. In six of the 23 cases of retinal change the changes were transitory. Repeated general examinations disclosed no cause for the retinal change other than diabetes. The authors' conclusion is that the retinal disorder must be attributed to the diabetes. Until a few years ago young people with diabetes lived for a comparatively short time. Now diabetes is controlled, patients live much longer and there is time for the retinal changes to develop. In regard to the lens changes, the authors state that their observations confirm the fact that diabetic cataract is comparatively common. The incidence in this series was 14% in 260 patients who were under the age of twenty-one years.

A Metal Safety Glare Goggle.

EDWARD STIEREN (*The Journal of the American Medical Association*, September 5, 1942) describes a safety goggle for industrial use which has the advantage over glass protective goggles that it cannot be broken by flying particles and that vision is not interfered with by steam, perspiration or grease. It consists of two aluminium shields, fitted into a frame of soft rubber, with an adjustable band of the same material to hold them in place. In the centre of the shield is a horizontal opening, one millimetre wide and forty millimetres long. A vertical opening one millimetre wide and ten millimetres long bisects the horizontal opening ten millimetres from the nasal end. In addition, a twenty millimetre long opening is added at an axis 15° off horizontal for vision in the lower field. The author states that the crude prototype of this goggle was originated by Eskimos to prevent snow blindness. The arrangement of the slots, by admitting a minimum of light, reduces glare. The goggle can be worn comfortably in bright light.

Visual Results in the Treatment of Trachoma.

H. S. GRADLE (*The Journal of the American Medical Association*, July 4, 1942) records some visual results obtained in the trachoma clinics in southern Illinois. The results are set out in tabular form. The author concludes that acute trachoma can be treated so successfully that less than 1% of infected eyes will become industrially blind. From the final visual standpoint systemic treatment with sulphanilamide is preferable to purely local treatment because (a) twice as many eyes show definite improvement in vision and (b) less than half as many eyes show positive losses in vision.

The Ophthalmologist and the Prevention of Traffic Accidents.

L. S. SELLING (*The Journal of the American Medical Association*, September 26, 1942) discusses the ophthalmologist's place in the prevention of traffic accidents. He thinks that the ophthalmologist should continue to work on the establishment of visual standards with the reservation that these standards in themselves must not be considered final. In any given case the ophthalmologist should make an evaluation so that future driving can be predicted from the whole picture, rather than from the point of view of visual acuity alone. There must be an

"educational rephrasing" of the whole picture in order to change some of the superficial aspects of the tests of a driver's vision. The present tests may eliminate from consideration persons with colour blindness and those with mild restriction of the visual field. The author holds that these conditions should not necessarily interfere with eligibility to drive. There are some acute and chronic conditions which are significant in the driving field. The author believes that driving restrictions on a basis of vision should be determined by a skilled ophthalmologist and not by a lay examiner. At the same time the ophthalmologist must be thoroughly conversant with the literature of visual acuity, visual disease and diseases of vision in relation to driving.

OTO-RHINO-LARYNGOLOGY.

Tumours of the Larynx, other than Squamous Cell Epithelioma.

F. Z. HAVENS AND E. M. PARKHILL (*Archives of Otolaryngology*, December, 1941) base their study on a series of unusual laryngeal neoplasms observed in the Mayo Clinic over a period of thirty years; it also includes a survey of contemporaneous pertinent literature which comprised reports of fifteen cases of sarcoma, three of hemangioendothelioma, one of adenocarcinoma and one of myeloblastoma. From the Mayo Clinic were recorded 26 cases of malignant tumour other than squamous epithelioma, eleven being sarcoma, eight hemangioendothelioma, five adenocarcinoma, one melanocarcinoma and one myeloma. In a series of 1,100 cases of malignant laryngeal disease there were thus for each 44 of squamous carcinoma, one of some other type of malignant disease. The sarcomata were usually found to be pedunculated, even when quite large, and infiltration was much less than in carcinoma, so that successful removal and lasting freedom from recurrence could be achieved through direct laryngoscopic approach or at most a laryngo-fissure. Two of the sarcomata were treated by radium. The hemangioendotheliomata caused symptoms of hoarseness and presented appearances described as "a fibrous nodule" or "a polypoid nodule". Treatment in all cases but one was by endoscopic removal. In the remaining case exposure was made through a laryngo-fissure. Post-operative irradiation is advised as the lesions are highly sensitive. Of seven adults with this type of growth, five were living and free of recurrence for periods ranging from fourteen months to nine years; one died after fifteen months with a recurrence, and one died of carcinoma of the stomach. Among the group of five patients with adenocarcinoma there were two hopelessly advanced cases. In two others death occurred with metastases one year and four years respectively after apparently successful treatment of the primary lesion. The remaining patient was well two years and nine months after laryngectomy. Although they express disappointment with this type of growth, the authors point out that the lesion tends to be slowly progressive, so that hoarseness, the outstanding symptom, was reported as being present for from five to nine years, the appearance of dyspnoea being the symptom which finally caused the

patient to seek medical attention. These tumours thus may be very extensive before they are first recognized. The appearance is described as a firm non-ulcerated tumour which may be nodular and have enlarged blood vessels over its surface. As these tumours are covered with a normal mucosa and a fibrous capsule, the biopsy specimen may have to be taken from well within the tumour. Metastasis from low-grade adenocarcinoma is not common. Radical surgical removal is advised, as irradiation is not to be expected to be of much benefit in these cases. In the patient with melanoma-epithelioma there was a dark brown mass arising from one arytenoid, and diagnosis was confirmed by microscopic examination. The patient was not treated at the clinic and the outcome was not known. There was one case of plasma cell myeloma which formed a pedunculated nodular mass arising from the aryepiglottic fold. The tumour was removed with the aid of laryngoscopy, the site was irradiated and the patient was reported to be alive and well after four and a half years.

Otogenic Cerebellar Abscess.

N. ASHERSON (*The Journal of Laryngology and Otology*, March, 1942) states that cerebellar abscess is rare. The majority of cases result from middle ear suppuration. Investigation of statistics by the author reveal that the temporo-sphenoidal lobe is affected with otogenic abscess about twice as often as is the cerebellum. From a review of the published details in the literature and from his own experience the author describes a "cerebellar or sub-tentorial cerebro-spinal fluid syndrome". In this the cerebro-spinal fluid pressure is only slightly raised, reaching to a pressure of 120 to 180 millimetres of water. There is a minimal increase in cells (under 100 per cubic millimetre) and lymphocytes predominate up to 100% of the total cell count. The chloride content is very slightly reduced and the chemical findings otherwise are barely altered from the normal. This type of cerebro-spinal fluid syndrome is contrasted with that of a temporo-sphenoidal lobe abscess in which the pressure rises to over 250 millimetres of water, and with other intracranial complications such as meningitis in which not only does the pressure greatly increase, but the cell count is high; neutrophile cells are in high proportion and there is considerable change in the chemical composition of the spinal fluid. Otitic hydrocephalus complicating cerebellar abscess is associated with a rise in the fluid pressure. Papilloedema is then likely to be marked, while the cells may fall in number or even disappear from the fluid. The author regards papilloedema in a case of cerebellar abscess as indicative of greatly increased pressure and therefore as a sign calling for caution in the performance of lumbar puncture. It is suggested, however, that lumbar puncture should not be feared, provided only a small quantity of fluid is allowed to escape, and, in cases in which there is danger of respiratory paralysis, the procedure is performed adjacent to or in the operating theatre with everything ready for immediate operation should complications ensue. A further syndrome supporting the diagnosis of cerebellar abscess is "le syndrome de discordance", in which the clinical condition of the patient pro-

gressively deteriorates, yet the cerebro-spinal fluid changes tend to resolve. Such a syndrome is indicative of encapsulated brain abscess, whereas in a resolving meningitis clinical recovery runs parallel with cerebro-spinal fluid improvement. Tuberculous meningitis, especially in young children, may have to be excluded, for this condition may occur at the same time as an otitis media and the cerebro-spinal fluid findings are similar to those of cerebellar abscess. Points in the diagnosis are the finding of the tubercle bacillus, a lowering of the chloride content and the fact that although the cell content is relatively low, it exceeds 100 in tuberculosis, whereas in encapsulated cerebellar abscess the count is under 100. The author stresses the need for making rapid cerebro-spinal fluid examinations in all instances.

Oestrogenic Implants in the Treatment of Atrophic Rhinitis.

L. K. ROSENVOLD (*Archives of Otolaryngology*, June, 1942) states that following the observation of Mortimer and his associates that some success was achieved in the treatment of atrophic rhinitis and osena with oestrogens given by nasal insufflation, and following similar encouraging results from intramuscular injections reported by Dorochenko, he decided to try the effect of making subcutaneous implants of these substances. In animal experiments Deanesly and Parkes had shown that "Estrone" (theelin) and "Estradiol" (dihydrotheelin) were absorbed at a rate of 2.5% to 9% per month. Testosterone and progesterone were absorbed much more rapidly. Studying the influence of the vehicle upon the rate and effectiveness of absorption, others had shown that compressed pellets produced the most pronounced effects. The author reports the study of twenty-four patients, including twenty women and four men, with atrophic rhinitis and osena, whom he has treated by implanting into the left upper abdominal wall pellets of 20 milligrammes each of pure chrySTALLINE α -estradiol. These pellets could be sterilized before use by boiling for five minutes in water. No other treatment was performed while the patients were under observation, except occasional routine removal of crusts to permit inspection of the mucosa. The condition of thirteen of the twenty female patients was definitely improved. In three cases there was no change. One only of the four males showed marked improvement, one showed slight improvement, and two no change. Initial improvement was usually noted one to eight weeks after implantation. Pellets removed after five months showed little diminution in size. After sixteen to twenty-four months re-implantation is contemplated in a number of the cases as the original effect seems to have diminished or disappeared. Slight temporary changes in the menses were observed in three of the females, and in two females and one male temporary tenderness of the breasts was reported.

Histaminase in the Treatment of Ménière's Syndrome.

MILES ATKINSON (*The Journal of the American Medical Association*, May 2, 1942) criticizes the routine use of histamine in cases of Ménière's syn-

drome, as advocated by Shelden and Horton from the Mayo Clinic in 1940. He considers that there are two groups of cases of Ménière's syndrome. Patients in the smaller group comprising less than a fourth of all cases are sensitive to histamine used in a cutaneous test. The results of this test must be rigidly interpreted and it must be remembered that histamine is an irritant substance producing a considerable reaction even in normal subjects. Treatment with histamine of patients in the smaller group gave satisfactory results in the author's hands. The effect of histamine in the larger group showing a normal cutaneous reaction to histamine, is that of any peripheral vasodilator such as amyl nitrite, acetylcholine or nicotinic acid. Later in this group histamine produces an increased frequency and severity of attacks and sometimes an increase of deafness. The author is enthusiastic about the results of treatment with nicotinic acid in the vasoconstrictor group which respond badly to histamine.

Specific Vaccine Therapy in the Treatment of Sinusitis.

M. SOLIS-COHEN (*Archives of Otolaryngology*, April, 1942) discusses specific vaccine therapy in the treatment of sinusitis. He lays stress on the need to employ in the vaccines those organisms which are responsible for the diseased state. He employs the method of pathogen selective cultures, made preferably during the subacute or chronic stage rather than during an acute exacerbation. Potentially pathogenic organisms are considered to be those which will grow in the patient's own blood. The pathogen selective vaccine consists of nine parts of the organisms which grow in the patient's blood and one part of those from a culture medium such as dextrose-brain broth. To determine the appropriate initial dose intradermal injections are made. The injections comprise 0.05 cubic centimetre of a control broth and three doses of 0.05 cubic centimetre each of the vaccine, the largest containing 50,000,000 organisms, the next one-tenth to a thousandth of this number, and the last one-tenth to a thousandth of the second dose. The amounts in the test doses depend upon the type, stage and severity of the disease. The smallest amount which gives a slight local reaction is administered therapeutically. Subsequent dosage is regulated in accordance with general, focal and local reactions. The aim is to avoid more than slight local reactions or unfavourable general or focal reactions by reducing the amount when such reactions are more than slight, and increasing dosage when no reactions and no improvement result. The usual interval is five days, but reactions should always be allowed to subside before the next dose is given; after severe unfavourable reactions an interval of ten days to four weeks should be allowed. Even when operations are undertaken, these vaccines are recommended in order to help to throw off infection which operation alone may not succeed in doing. Nevertheless it is conceded that when drainage of an infected sinus is poor, operation to overcome this is essential, and until this is done vaccines may fall or may even increase the symptoms. No statistics are given of the author's experience, but it is claimed that results are favourable.

Public Health.

PARLIAMENTARY JOINT COMMITTEE ON SOCIAL SECURITY.

THE Parliamentary Joint Committee on Social Security was appointed "to inquire into and from time to time report upon ways and means of improving social and living conditions of the people of Australia and of rectifying anomalies in existing legislation". The personnel of the committee is as follows: Mr. H. C. Barnard (Chairman), Senator Cooper (Deputy Chairman), Senator Arnold, Mr. Maurice Blackburn, Colonel R. S. Ryan and the Honourable J. A. Perkins.

The committee has been taking evidence in Melbourne and a précis of some of this evidence was published in last week's issue. In this issue we give an account of the evidence of Dr. J. G. A. Winter Ashton.

Dr. J. G. A. WINTER ASHTON, being sworn, read a statement to the committee. In this statement he said that the opinions expressed by him were entirely personal and represented those of one who had been in active general practice for fifteen years in what might be called a good residential area—who was actively associated with a large metropolitan hospital—and who had had some experience of medico-political matters, having been a member of the Victorian Branch Council of the British Medical Association from 1937 to 1942. He had had only three months' experience of practice in the country and so experience of practice in an industrial community. The committee would realize also that in making these statements the intention was only to give a "background" so that members might better assess the true value of any opinions expressed.

In submitting this evidence, his endeavour had been to follow the outline of the *questionnaire* as far as possible, but for the sake of completeness and sequence of thought, to devote most time to Question 1, which had to do with the type of health service required by the people of Australia.

Question 2 was a brief critical analysis of the schemes mentioned—the National Health and Medical Research Council scheme, the Federal Council scheme, the New Zealand scheme, and national health insurance.

The answer to Question 3 regarding the introduction of services during the war was in the negative.

To avoid repetition, he had only touched on two or three points of Question 4 (dealing with child and maternal welfare, hospitals, tuberculosis, group practice and so on).

He found himself unable to offer any evidence of value on Question 5 dealing with finance, and in reply to Question 6 he wished to point out the urgent necessity of full information being given to the whole medical profession of any proposed changes in the medical service to Australia.

Dr. Ashton presented the following statement.

Question 1: What is your conception of the medical, hospital and health services required by the people of Australia, and how and under what conditions do you consider such services should be provided?

Medical Services Required.

Basic principle is availability of medical aid for any sick or injured person, standard of such aid, in first instance, to be general practitioner, to be followed by specialist and investigational attention later—if advised or found necessary.

Two factors to be considered:

1. **Geographical.**—Can divide Australia into: A, large cities and suburbs; B, two, three or four man towns; C, sparsely populated country districts, including one man towns. In normal times, medical aid is available to all A and B residents, but C is a problem which has been made more difficult by the war.

2. **Financial.**—Divide population into five classes: (a) wealthy—above £1,500; (b) comfortably off—£600 to £1,500; (c) middle class—£400 to £600; (d) basic wage earners—£400; (e) unemployed—indigent, old-age pensioners *et cetera*.

Classes (a) and (b) can pay for all medical and hospital services. Class (c) can pay for a lot of medical and hospital services. Class (d) can pay only a fraction. Class (e) can pay nothing.

Class (d) can insure to a great extent against sickness by joining a friendly society. Class (d) is numerically much the larger. Class (d) and (e), and also class (c) to some extent, are catered for major illnesses by public hospitals. Class (c) should be in a financial position to insure against

medical expenses of major illnesses (insurance companies *et cetera*) and hospital expenses by Hospital Benefits Association.

The essential requirements for a general medical service are described in the Federal Council's scheme and this is an admirable presentation of the "problem"—particularly from the theoretical point of view, but as far as its "plan" goes, some criticism can be offered. This will be dealt with later.

Under normal circumstances (that is, exclusive of war) there is adequate medical personnel in Australia to fulfil the basic principle. The problem everybody is endeavouring to solve is, "The best method to make this available to the sick individual", for it is my considered opinion that any scheme must stand or fall by its ability to satisfy any person who is sick or injured that he or she is getting the best possible attention under the best possible circumstances. It appears to me therefore that the medical requirements of the community can be exemplified by taking a hypothetical case of Mr. Smith, who wakes one morning feeling unwell. His first decision is: "Am I sick enough to see a doctor?" Having answered this in the affirmative, his next question is: "Whom shall I consult?" If he already has a family doctor who has given him good service in the past, he will consult him. If not, he will try to obtain the services of a doctor with a good reputation in the district, though if he feels in great pain or acutely ill, he will be content to get the first medical help available—at least, in the first instance. In other words, except under exceptional circumstances, he will prefer to exercise at least some choice in his medical attendant.

Having decided whom he will consult, his next question is: "Should I go and see the doctor, or ask him to visit me?" The answer to this may be easy, or he may be in doubt. If in doubt, it would be helpful to him to be able to get in touch with the doctor, explain his symptoms and abide by the doctor's decision. If he decides that he is able to go to the doctor, the best arrangement would be to make an appointment to see the doctor, thereby saving him time and unnecessary waiting, but in many cases it will be essential for the doctor to go and see Mr. Smith, and therefore provision must be made for domiciliary visiting.

To proceed, this decision having been taken, Smith is seen by the doctor, either at his home or the doctor's surgery, who examines him and makes a diagnosis which may be definite (for example, measles, pneumonia or acute appendicitis) or purely a provisional or working diagnosis (for example, a fever of unknown origin). From this point on, till the patient is cured or dies, subsequent decisions should be made by the doctor, but always with the patient's concurrence. The latter is essential if the patient's full confidence is to be maintained. A diagnosis having been made, the doctor's next decision is: "What is the correct treatment for this condition?" This is purely a medical or technical matter, but the next decision, "How and where can this best be carried out?" is a matter of considerable moment to us in this discussion. The condition may (and in the large majority of cases will) be simple and ordinary home treatment, plus two or three visits from the doctor, may cure the condition. On the other hand, the condition may not be simple and the doctor may decide that the case of Mr. Smith requires: (i) professional nursing at home; (ii) hospital treatment; (iii) an operation; (iv) a consultation with another practitioner or a specialist; (v) further investigations, particularly an X-ray examination or various laboratory or pathological examinations.

Under present conditions of medical practice, a decision to make any, or all, of these available to Mr. Smith will at once increase the financial aspect of his illness, and so the doctor's next remark will be: "You need to go to hospital, or you need an operation *et cetera*. Can you afford to pay for it, or shall I send you to a public hospital?" But a proper conception of Mr. Smith's medical requirements should be such that the financial side should not have to be taken into consideration, but only what is the best and quickest way to make Mr. Smith well again.

Let us study these five possibilities in greater detail:

1. **Professional Nursing at Home.**—Some illnesses will require the services of a full-time nurse, but many others will need only part-time nursing which can be adequately provided by a visiting nurse, and three points I wish to stress are: (a) The greater the number of patients who can be adequately and efficiently nursed at home, the less the strain that will be imposed on hospital accommodation. (b) A point which is often lost sight of is that, other conditions being satisfied, there is a great number of sick people who prefer to be nursed at home, that is, they prefer to remain in their own family circle, and in some instances

this may be advantageous with regard to their quick recovery. (c) A nurse can often perform many services for the sick which otherwise would have to be done by the doctor, for example, injections. In addition, the number of visits which it is necessary for the doctor to pay may be reduced in certain cases.

Taking the above points into consideration, it is my opinion that the inclusion of a "home nursing plan" is necessary in any general medical service.

2. *Hospital Treatment (or Hospitalization).*—This has come more into demand over the last ten years because of: (a) Greater ease of diagnosis and treatment in difficult cases. (b) Greater difficulty of nursing people at home because of the "domestic problem" and also "flat life".

The occupation of any hospital bed by a person who is not definitely in need of hospital attention or treatment is uneconomic and a system of convalescent depots situated in salubrious areas in close proximity to the cities would be of great help.

To revert to our Mr. Smith: the doctor may decide that he should go to hospital, but that his condition is such that the treatment is well within his (the doctor's) scope and also that Mr. Smith will not require all sorts of expensive and elaborate forms of treatment to get him better. In addition, Mr. Smith, being a human being and possibly married with children, will not wish to be moved too far from his home, unless it is absolutely necessary. (The point of view which regards Mr. Smith as just a case to be sent here, there and everywhere at the whim of this or that medical officer is one which I deprecate strongly.) So the doctor should be able to send Mr. Smith to some hospital in the neighbourhood where Mr. Smith can get all the necessary attention and where the doctor can continue to attend him. Such a hospital of, say, around fifty beds, should be able to take care of all ordinary medical or surgical cases.

It may be that our Mr. Smith will be found to be suffering from some disease which the above hospital cannot deal with adequately. In this case, he will be transferred to the large central hospital. If the present large public hospitals were reserved for this type of case, it is likely that they would be quite sufficient for the community's needs.

On the other hand, Mr. Smith may be suffering from an incurable condition (for example, cancer), in which case he should be transferred to an institution dealing with these cases. There are many other so-called incurable conditions which should also be taken into account—for example, chronic arthritis cases, cases of fractured thigh in old people, and the aged and infirm suffering from senility and chronic invalidism. Adequate accommodation for this class of case is very necessary and would do a great deal to reduce the present pressure on what may be termed "curative" beds. Lastly, Mr. Smith may prove to be a tuberculous patient, in which instance he should go to one of the sanatoria designed for their treatment.

During Mr. Smith's stay in hospital he should be under the primary care of his own doctor if and while he remains at the local or district hospital. Movement to another institution will make it impractical for his own doctor to look after him and so he will come under the care of another medical man, but on return to his own home, his own doctor should be informed briefly of his medical history whilst out of his care.

It will often happen that after Mr. Smith has been two or three weeks in the hospital, he will have recovered sufficiently to no longer warrant his occupying a "curative" bed, but he will not be well enough to return home. For city dwellers especially, the opportunity to convalesce in country air for seven to fourteen days would be a great advantage and would often set the seal on the patient's recovery. Such convalescent depots, though regarded by some as a luxury, have proved their usefulness in the rehabilitation of men in the Armed Forces.

3. *Operations.*—If Mr. Smith requires an operation, he may be moved to the local hospital. It may be of such a nature that his own doctor is fully capable of doing it, or it may be of such a special nature that another surgeon of greater experience has to be called in. The choice of surgeon should be left to the doctor, with the patient's approval—as far as possible—but in any case the doctor should be present at the operation (perhaps giving the anaesthetic) and take an intelligent interest in the after treatment, even if not entirely responsible for it.

4. *Consultations.*—These may take place either at Mr. Smith's home or after he has been moved to hospital. The choice of a suitable consultant should again be left to the doctor as far as possible.

5. *Investigations.*—These are largely impersonal affairs. They may be carried out at the patient's home or at hospital. There appears to be little or no reason for a choice here. The present cost of these services is too high and it might well be that one of the first aspects of this whole problem, to which the Government might devote its attention, is the arranging for suitable investigational centres, staffed by salaried officers. This class of work is technical—impersonal—and usually non-urgent; that is, a 9 a.m. to 5 p.m. service usually suffices, so that it lends itself to a salaried scheme. Ideally, these centres should be situated at the local or district hospitals, so that they could cater both for the patients in hospital and also those sent from outside for investigation.

So we have briefly run through what may happen to Mr. Smith if he gets ill, but one of modern medicine's ideals is prevention, which is closely allied to public health. I have insufficient knowledge of these matters to offer any evidence, but the old axiom that "prevention is better than cure" should be established in any medical scheme.

There is little difference of opinion amongst all investigators of the problems as to what constitutes the ideal of medical and hospital services to the community, but there is some danger that the protagonists for any particular scheme are apt to wish to make the sick person fit into their scheme, rather than make their scheme fit the needs of the sick person. Hence the attempt in the above outline to make the medical requirements personal, as seen through the eyes of a patient.

Provision of Such Services.

How is this ideal to be provided for everyone, irrespective of his financial status? This is the problem which is exercising all investigators and various schemes have been proposed. The basis is strictly financial: (i) Who is going to pay for the services rendered? (ii) How are the personnel (that is, the doctors chiefly) to be paid.

1. If the Government accepts financial responsibility for any scheme, it can be paid for (a) out of general revenue; (b) by a special tax (for example, New Zealand); (c) by a scheme of insurance, making those who will benefit most contribute at least a large proportion of the money required (for example, the national health insurance scheme).

If the scheme is to embrace the whole community, then either method (a) or (b) would appear more equitable, but if it is to be limited to those of a certain class either geographical or financial, then method (c) is the method of choice. The final choice must be one for the political authorities.

2. The doctors can be paid for their services under one of three methods: (a) on a "salary" basis, (b) on a "capitation fee" basis, (c) on a "fee for service" basis. Allied to this problem is that of "free choice of doctor". The majority of medical men are still of opinion that this choice gives the sick person definite advantages which are: (i) A much improved personal relationship between patient and doctor. (ii) A definite incentive for the doctor to give of his best in each individual case. (iii) A distinct feeling on the patient's part that the doctor of his own choice is doing his best for him.

Two or three other points: (i) For certain geographical reasons, there may be no choice of doctor at all. (ii) In emergencies, any doctor is better than none. (iii) For investigational and second opinion, the choice should be with the doctor rather than with the patient.

It will be obvious that "free choice of doctor" is consistent with payment on either a "capitation" fee or "fee for service" basis, but is inconsistent with payment on a "salary" basis.

Method of Payment of Doctors.

From the profession's viewpoint this is a very vital matter.

"A." On a "Salary" Basis.—Advantages:

1. The big advantage usually stressed here is that the doctor has no financial interest in the patient's sickness.
2. Another advantage is that a doctor on commencing practice has little, if any, financial outlay.
3. Again, being paid on a salary basis is held to imply limitation of daily hours of work—time off duty each week—holidays—and some pension or superannuation scheme—advantages enjoyed at present by the vast majority of Government servants.

Disadvantages:

1. As the doctor will look to a third party for his salary, numerous regulations will be required and a mass of red

tape methods may be introduced so that a large proportion of the doctor's time will go to filling in forms instead of the prime duty of looking after sick people.

2. It is felt by many people that payment on a "salary" basis will reduce all doctors to the same level. The loss of financial incentive and competitive spirit may lead to a levelling mediocrity in the work done.

3. The introduction of a "salary" basis as opposed to the present basis of practice will lead to financial loss and even hardship in many cases, as it is unlikely that the salaries paid will be comparable in many instances to the incomes made in practice at present.

It is impossible to do more than generalize about "a salaried scheme" until definite indications are given as to (a) scale of salaries to be paid, (b) amount of "time off" and holidays, and (c) question of compensation for any existing goodwill. If and when these are indicated, it will probably be found that the profession can be divided into three age groups as far as their reactions to such a scheme will tend: 1. Those approaching the retiring age. 2. Those in active general practice. 3. Those commencing, or about to commence, practice. The advantages are likely to weigh with groups "1" and "3", and the disadvantages with group "2".

This matter was discussed at a meeting of the Eastern Suburbs Subdivision of the Victorian Branch of the British Medical Association on December 11, 1941, at which fifty members were present (see THE MEDICAL JOURNAL OF AUSTRALIA, March 7, 1942, pages 298 and 299).

The following resolutions were carried:

1. A State (that is, salaried) medical service must take into adequate consideration the just requirements of the general practitioners of the country.
2. Adequate compensation should be made for existing practices. (The meeting was unable to determine what was adequate compensation. The following suggestions were made: (a) The average of one year's takings over the past five years. (b) Two-thirds of this. (c) One year's average less one year's salary. (d) The pension or superannuation to be reckoned as adequate compensation.)
3. Should a salaried service be instituted, the salaries should be adequate and reasonably related to present earnings of general practitioners, and appointments to higher salaried posts should be based on (a) years of experience, (b) professional experience, (c) professional skill.
4. Pensions to be granted on retirement and provision to be made for dependants if death occurs before retirement or disablement.
5. Daily hours of attendance to be limited and time off duty to be given each week. Annual leave and sick leave to be granted on pay.
6. Refresher courses should be provided periodically on pay.
7. Opportunities should be granted to general practitioners for means of obtaining specialised experience and for research.
8. District clinics should be established at hospitals to which the general practitioners should have access for the treatment of their patients.
9. For the success of a State medical service, the general practitioners should have fair representation upon any planning board for the institution of such a service and in its subsequent administration.
10. Some provision to be made for travelling expenses for domiciliary attendance.

"B." On a "Capitation Fee" Basis.—This is really a type of insurance; the capitation fee representing the "premium" and looking after the sick people the "liability" of the doctor. But no insurance company would accept the principle of an unlimited liability for a limited premium, and it is unfair to ask this of medical men. In addition, it offers no safeguards to the doctor with regard to unnecessary and trivial calls. It is the basis of payment under the present lodge agreement, and although it has worked in Victoria for some years, it is bad in principle unless properly safeguarded by certain restrictions which would make it very cumbersome. This method of payment was fought strenuously by the doctors in New Zealand, so much so, that the Government was forced to allow an alternative "fee for service" method later. (See also criticism by National Health and Medical Research Council, Eleventh Session, re national insurance, THE MEDICAL JOURNAL OF AUSTRALIA, August 16, 1941, page 183, section 31.)

"O." On a "Fee for Service" Basis.—The advantages of this are: 1. The patient feels under no obligation to the doctor as he knows the doctor is being paid for the particular service rendered. 2. The doctor feels no resentment at being consulted by the patient. 3. It allows free choice of doctor. 4. The interposition of a third party between patient and doctor is reduced to a minimum.

The fee is paid out of a pool (as in New Zealand). It is said that this leads to unnecessary visits being paid, but such a scheme is working in Victoria (Workers' Compensation), where the doctors are paid on a "fee for service" basis, according to a schedule, out of a fund which is formed from the insured workers' premiums. This is quite small (2s. 6d. a year), and yet the underwriters make a profit. The average doctor is satisfied with a "fair thing" and penalties could be devised for the few who overstep the mark.

Again, if the "fee for service" guaranteed is less than that usually charged, that is, if the patient had to contribute something to the cost of the service rendered, this will be an added check, and yet, in the case of the indigent *et cetera*, the doctor will not have to work entirely for nothing, but receives a certain basic fee.

To sum up, my opinion is that the best method of payment for any prospective Government medical service would be on a "fee for service" basis, paid out of a pool controlled by the Government, the actual method of filling the pool being on a tax or contributory basis with a Government grant added—if found necessary.

The only two exceptions to this might be:

1. A salaried service limited to sparsely populated areas (where the income derived from a "fee for service" basis would not be sufficient to keep a medical man).
 2. A salaried service for the staffing of investigational centres (including X-ray centres). (See Investigations.)
- Further, I do not see how the medical profession can indulge in more than generalities until the Government decides on the method of payment. This having been decided (with the profession's cooperation), members will be able to devote themselves to details.

Administration and Control.

Whatever scheme is adopted, some form of administrative body must be set up to control it.

Now the bigger the scheme, the bigger the controlling body (with regulations, forms, certificates *et cetera*) must be. This increases the overhead cost and also increases the "office work" of the doctor, thereby diminishing his "curative work" by the same amount. That this is a definite fact, the experience of many army medical officers will confirm. Here we have a "salaried medical service" working under our eyes and it is suggested that a similar scheme translated into civil practice would give grave cause for dissatisfaction both among the medical officers and the patients in many respects.

For a Commonwealth scheme it is obvious that there would have to be a Federal controlling body with subsidiary committees in various geographical subdivisions (possibly the States).

The medical profession is emphatic that it must have adequate representation on these bodies, but I should like to go a step further and state that it is essential that such medical representatives be appointed from men in active practice. It is only men who are in every-day contact with the trials and difficulties of looking after sick people who can understand and solve the manifold problems which arise. It would be a mistake to appoint a great proportion of older men who have made a name in the profession, or men who have spent the greater part of their medical life in an "office" capacity. In my opinion, it is the fear of such happening that makes many doctors oppose a "service" of any kind, for they know that unless the control is in the right hands, the conditions of service will be intolerable.

Question 2: Are you familiar with and which, if any, of the following do you consider suitable for application in Australia: (a) the proposal of the National Health and Medical Research Council for a salaried medical service; (b) the proposal of the Federal Council of the British Medical Association in Australia for a general medical service in Australia; (c) medical, hospital and related benefits as in operation in New Zealand; (d) national health insurance?

National Health and Medical Research Scheme.

In its broad outline, this scheme has some good points, especially if a salaried service is favoured, but it does not stand up well to detailed examination. Its treatment of "A"

and possibly "B" class centres is reasonable, but "C" and "D" centres and the capital cities are far too theoretical and impractical.

The accommodation suggested at the consultation centres would be hopelessly inadequate to deal with the number of consultations which could be expected under a "free for all" service.

The scheme states that it is not inconsistent with retention of private practice, but it, in fact, estimates for a medical personnel embracing practically the whole of the practising profession in Australia. Who would be left to do the private practice? (See National Health and Medical Research Council report, page 15, where it is stated that the scheme safeguards "free choice of doctor", but this is impossible in any salaried scheme.)

It makes no allowance in its estimate for doctors on sick leave—nor does it attempt to define the average number of hours per week a doctor should be on duty.

The scheme is based almost entirely on bringing the sick to the doctor. Scant provision is made for visiting in the home; the only reference being "a certain amount of domiciliary" visiting will be necessary for persons who do not need in-patient treatment, but are unable to attend at the consultation centre. Old people and children, especially, need home visiting.

The whole scheme indicates that it was not drawn up by a body which is conversant with the actual needs and problems of active practice, and it should not be accepted as more than a theoretical basis, which will require tremendous modifications if a salaried service is finally decided on.

I do not consider it suitable for application in Australia, except in the case of group "A" centres in sparsely populated districts.

Federal Council of the British Medical Association Scheme.

The statement of the "problem" is admirable, and as such embodies the general views of the medical profession in Australia with regard to the theoretical improvements required in medical services. These views should be carefully studied, for any scheme propounded must include them to have any chance of satisfying the majority opinion of medical men in Australia.

The "solution" offered (that is, payment of doctors by capitation fee and limitation of this to those earning £416 and under) deserves criticism.

The arguments against a "capitation" fee have been examined (see above); they are strengthened by the opinions expressed by the National Health and Medical Research Council, Eleventh Session, sections 30 and 31 (see THE MEDICAL JOURNAL OF AUSTRALIA, August 16, 1941, page 183).

Personally, I am not in favour of such a system and consider it would be a retrograde step.

New Zealand.

Medical Benefits.—There are at present two schemes operating concurrently: (a) a "capitation" scheme, (b) a "fee for service" scheme. It is apparent that the Government was forced to bring in a "fee for service" scheme because of the strong objections of the medical profession to the "capitation" scheme, which made the latter unworkable. This is a point which should be carefully noted.

There appears to be no valid reason why both schemes should be introduced in Australia.

With regard to "fee for service" basis, the general scheme, as outlined on pages 8, 9 and 10 of the Department of Health's brochure, is not open to serious criticism. Certain provisions are very practical; in particular:

1. The payment of a larger fee for Sunday and night calls (12s. 6d. instead of 7s. 6d.) and any call or visit over thirty minutes' duration.

2. Medical practitioners are not obliged to accept the payments from the fund in full satisfaction of their charges. This allows doctors of higher professional standing to be more adequately remunerated and also encourages them to attain such a position in the profession.

3. Certain obligations are imposed on patients and a penalty is imposed for non-compliance therewith. These are most necessary.

4. Certain obligations are imposed on medical practitioners—again with penalties for non-compliance. These, again, are necessary.

5. Provision has been made for the inclusion of "specialist services" under this scheme—though it is well to note that the Government has given notice of its intention that a

salaried service for specialists and consultants may be introduced in the future. Such a provision would make a second opinion more easily obtainable, and as the decision for the advisability of this second opinion should rest with the doctor already in charge of the case, it is unlikely that the specialist's services will be called on unnecessarily.

It appears that the working of this "fee for service" scheme in New Zealand is worth watching carefully, as, if successful, it might well be the basis for some similar scheme to be introduced into Australia.

National Health Insurance.

This is taken to mean that proposed under the Federal Government Act of 1938.

From the medical benefits viewpoint, there is nothing to commend this scheme. It was very severely criticized and aroused tremendous opposition from the bulk of the medical profession in Australia, and I do not think it would be accepted.

It has been ably and succinctly criticized by the National Health and Medical Research Council in the report of its eleventh session (see THE MEDICAL JOURNAL OF AUSTRALIA, August 16, 1941, pages 183 and 184, sections 28-31 inclusive). I find myself in complete agreement with the opinions here expressed and think that a first step to clear the way for any further discussion is for the Government to delete this measure from the statute book.

Question 3: Do you consider any of the following services could and/or should be introduced during the war: (a) the whole or any portion of any such scheme as you favour; (b) any other medical, health, hospital or welfare services or benefits; or alternatively (c) that any financial provision should be made for services or capital expenditure after the war; (d) if your answer to the above is in the affirmative, can you give details?

It is possible that any scheme could be introduced during the war, but as far as medical benefits are concerned, my answer as to whether they should be introduced during the war is an uncompromising "No".

We already have the Minister for Social Security's promise that no such legislation will be introduced. It would be a gross injustice to the doctors on active service (roughly one-third of the profession) for such a promise not to be kept.

Question 4: Have you any proposals regarding the following which you would like to submit and which might be included in a comprehensive health scheme or as an instalment of it: (a) child welfare; (b) maternal welfare; (c) tuberculosis; (d) hospital benefit schemes; (e) hospital accommodation and organization; (f) group practice; (g) national fitness; (h) any other health services or benefits; and which of these, if any, do you consider should be introduced (a) during the war, (b) after the war?

This evidence will be limited to a discussion on: (b) maternal welfare, (d) hospital benefit schemes, (e) hospital accommodation and organization, (f) group practice.

Maternal Welfare.

The cost of having a child for the middle and lower income classes is too high—when medical, hospital, pre-natal and post-natal attention, and the necessary domestic supplies, are taken into account.

In Australia, every healthy newborn child is an asset to the country, and therefore the country as a whole should help towards the cost of production.

The present £5 baby bonus is inadequate. Some greater financial relief is necessary, and the scheme of maternity benefits operating in New Zealand has much to recommend it. As far as the doctor is concerned, it is on a "fee for service" basis—it contributes the whole or a substantial part of the hospital expenses, which are not necessarily limited to fourteen days after the confinement. (Many doctors think that twenty-one days is necessary, in order to decrease later morbidity.)

No provision is made for domestic help in the first few months of the baby's life. Provision of some form of home nursing or help would be an advantage. I see no reason why some form of maternity benefit should not be introduced during the war.

Hospital Benefit Schemes.

The Hospital Benefit Association in Victoria works well and is a help to many people in serious illness, enabling them to finance an illness for which, otherwise, they would have to depend on charity. Further extension of such schemes is desirable.

Hospital Accommodation and Organization.

Leaving out the public hospitals—the great need in Melbourne is for a much larger number of cheap paying beds (three to three and a half guineas per week). The provision of these would ease the pressure on public hospital beds, for there is a big class of people who could pay this fee, but who cannot pay four and a half or five guineas a week. The so-called "intermediate hospitals" are all gradually raising their fees and are becoming simply large "private hospitals".

A statutory provision that all hospitals must make available a certain percentage (for example, 25% or 33%) of their beds at a fixed charge (say three guineas a week) would help to counteract this tendency.

With regard to organization, new hospitals of 50 to 60 beds built in selected areas in the suburbs would be of great value. If they were on a true "community" basis with some free beds, many cases, which are at present sent into the city hospitals, could be kept in the suburbs under their own doctors.

A Government grant to help such a scheme for a "ring" of suburban hospitals might be made an immediate post-war provision.

Group Practice.

The association of medical men into groups or clinics is a modern trend especially well developed in America, though it has not, as yet, been well marked in Australia.

A group or clinic offers advantages to the patient and to the members of the group.

Actually, the regulation of the doctor's working hours, holidays et cetera can be just as well arranged in a group practice as in a salaried service. If the Government wishes to encourage the formation of such groups, some form of financial help in the way of rebate of income tax should help.

Question 6: Have you any suggestions as to the means that should be adopted to secure the introduction and efficient administration of a comprehensive health scheme in Australia, or any part of such scheme, and the cooperation of all interested parties?

It is an indispensable condition that the introduction and efficient administration of any comprehensive health scheme into Australia must be made with the willing cooperation of at least the great majority of the medical profession. Failure to obtain this will result in chaos and confusion.

How can this be achieved? There are certain facts in the matter which the average layman does not realize. He is apt to think that the medical profession has a strong body, the British Medical Association, with its Federal and State councils, and that these councils are able to speak for the profession as a whole. This may be so in many purely medical matters, but when it comes to such a vast change as altering the whole conception of medical practice, then it is very definitely not the case. The councils have no power to bind their members, nor do they necessarily represent the majority opinion on any medico-political issue.

In the first place, medical men are essentially individually minded, and there are many differences of opinion amongst them as to what is the best scheme; and these opinions are sincerely and strongly held.

In the second place, the introduction of any scheme must alter their conditions of livelihood, and here again there is room for a wide diversity of opinion.

In the third place, most medical men realize that there is "something in the wind", but they are completely in the dark as regards the Government's intentions. This engenders fear and mistrust.

The obvious and reasonable way to remedy this is for the Government to communicate with all doctors in Australia and on active service by letter, giving them all the information which it is possible to give. This will enable each doctor to form a considered opinion on any proposals so put forward and will remove the feeling that something is being done behind his back.

The layman must realize that the average medical practitioner is very busy, especially these days, and it is unfair to ask of him that he devote a great deal of time and thought to various nebulous schemes which have little chance of being solidified. There are men in the profession who have devoted a great deal of time to this subject and some of them who have very definite views as to what is the right scheme, whilst others prefer to keep a more open mind. The danger is that the convinced opinion of the individual may be taken to represent the convinced opinion of the majority, or even of a large number, giving the layman a false idea of the reaction of the profession in general.

When the profession has received and has had time to consider the necessary information, the Government should ask it to appoint a committee to meet it in conference. This committee should be appointed for this specific purpose and the personnel should be left entirely to the general body of the profession to decide. Government nomination, or nomination by any British Medical Association Council, without the full approval of the profession will not achieve the desired effect. This does not mean that unanimity of opinion will necessarily be arrived at, but at least the profession will feel that its point or points of view have been adequately placed before the Government.

The above views are expressed after consideration of the upheaval which took place in the medical profession during consideration of the *National Health and Pensions Insurance Act* in 1938, and is an attempt to foresee and possibly prevent the same thing happening again.

In reply to Colonel Ryan, Dr. Ashton explained the constitution of the Branch Councils of the British Medical Association in Australia and stated that members of Council were elected as good doctors or as men well thought of, but the Council did not necessarily represent the general views of the profession on any one particular medico-political problem.

Colonel Ryan stated that one of the difficulties of the Government was to consult a profession of 4,000 members. All they could do was to get the views of selected members who might be expected to represent the views of the profession as a whole.

The witness stated that he considered it essential to inform the profession fully of the intentions of the Government, and that a way should be found of consulting men absent on service. He thought the views of the profession could be ascertained by questionnaire or referendum, but as questionnaires were usually answered by only about 25%, a referendum with compulsory voting would be better. He was of the opinion that the first requirement should be to find an acceptable method of payment and build up a scheme on that basis.

Dr. Ashton said that, although he had stressed his opinion that the administrators of any scheme should be practising doctors, he meant by that that they should be men with recent experience of active practice and agreed that it might not be possible to have men carrying on both administrative and clinical work. He could not say what the average earnings of practitioners were and disliked any system of averaging, because it resulted in a levelling mediocrity. He estimated, however, that established general practitioners earned from £1,000 to £1,200 a year, after deduction of practice expenses, and not £800, the figure suggested by Colonel Ryan. In his own practice he had a very definite family relationship with about 50% to 60% of his patients, the remainder being people who sought his services casually. He thought that his family patients definitely desired his personal services, and of the casual patients, 20% probably came on recommendation and the others of their own initiative. He believed that in any system in which the patients had no choice of doctor there would be a lack of confidence and was quite certain that people would hate to take their children to a doctor they or their children disliked, and, in such circumstances, one of the dangers might be that they would fail to seek medical aid for their children.

Dr. Ashton considered that in establishing institutions for the care of persons suffering from incurable diseases, the naming of the institutions was important because "incurables" fell into two groups—those who were inevitably going to die in a short time, and those with some chronic illness, such as rheumatoid arthritis, who might live for many years. He thought that in many cases of senility institutional care was to be preferred, as such persons cared for in their own homes were a problem and they had a bad effect on children residing in the households. He was of the opinion that many of the privately run convalescent homes could be improved, and, as the average age of the community was rising, it was obvious that more and more old people must be catered for in the future.

Dr. Ashton believed that in planning an adequate number of hospital beds for the community there should always be more beds than were actually needed because of fluctuations in sickness incidence.

In reply to Senator Cooper, the witness stated that he favoured some scheme for the provision of a health service to the general public and was in complete agreement with the appreciation of the problem published by the Federal Council of the British Medical Association. He expressed

the opinion that in isolated areas salaried doctors might be necessary.

Although, however, a salary might keep a doctor in an isolated town, which otherwise would be abandoned, he could not see that the quality of that doctor's service would be any better. Except in remote areas he considered payment for service a better method than payment by salary.

Dr. Ashton thought that specialized service to the out-back might be provided by the employment of salaried junior specialists who now frequently had a "hard row to hoe" in their earlier years, as a decision to specialize often depended on financial resources rather than brains.

Dr. Ashton, although emphatic that any scheme for the provision of medical services should be administered by practising medical men, was not opposed to lay representation on the administration. He could visualize a common administration responsible for the control of medical services on both salaried and fee-for-service bases, but thought there would be a lot of red tape in a salaried service. There was little red tape in hospitals controlled by committees of management, but these hospitals, in general, were staffed by honorary medical officers who could retire from their positions when they chose. He did not know if there was much red tape in the Commonwealth Health Service, but had no great admiration for the State Health Service. He could not see that, in a salaried service, patients would have choice of doctor. How could there be, when in a salaried group of, say, three doctors, two might be liked and one disliked? In such a service everyone would drop to the same level and there would be difficulties and jealousies over questions of promotion. Despite the system, in Melbourne, of appointing honorary medical officers on the recommendations of an advisory board, there had been criticisms of many hospital appointments. A salaried profession would become like public servants and lose efficiency.

Dr. Ashton favoured the establishment of many more smaller suburban hospitals rather than the building of huge central institutions. Suburban hospitals could cope with many patients, now compelled to travel miles for treatment and to wait for hours in public hospitals, if medical service was provided on a fee-for-service basis. Local doctors could do a great deal of the work if proper arrangements were made.

If the Government proposed to introduce changes in medical practice, Dr. Ashton considered that a complete scheme should be submitted to the profession which could then elect, through the machinery of the British Medical Association, with Government backing, a representative body to consult with the Government. Admitting that such an elected body would not necessarily have the support of the whole profession, such a method would be fair, and, although he might vote for a representative who desired a salaried service, he assumed there would be no compulsion in the matter and he would not be obliged to join such a service. He thought that any proposal to prepare a scheme for doctors on active service to step into on demobilization, rather than to let them return to their practices from which they might later be withdrawn, would be most unfair and, although that might honour the Minister's promise in the letter, it did not honour it in the spirit.

The profession could not be expected to continue discussing generalities; it must get down to "tin-tacks", and why could not the Government say what its plans were without taking steps to introduce them? Many men on active service were having their practices kept open for them and he did not think that a great number of men returning from service would not be absorbed.

Replying to Senator Arnold, Dr. Ashton said he was not opposed to planning, but he did not want the men on active service to think that something was being "put over them". The method of payment must be defined before any plan could be made and he thought that the method he had already suggested for obtaining the views of the profession would be better than the calling of meetings which would elect and instruct representatives. In seeking the profession's views, arguments for and against any plan should be put before its members.

If a salaried service were introduced, Dr. Ashton thought it would be unfair to country people to supply them with young and inexperienced doctors, and doctors appointed to such areas might be encouraged to stay there by salary increments if, as in many cases, they preferred working in the country.

The witness definitely considered that patients did desire choice of doctor. Certain doctors had better methods, but the exercise of the art of medicine as opposed to the science of medicine could be compared to the same scene painted by two artists with very different results, and

choice of doctor often influenced the cure of the patient. In his public hospital work he attempted to, and frequently did, establish a personal relationship with patients, but there was a type of hospital practice where that did not occur.

Rate of salary was not, perhaps, of paramount importance, but it was human nature in medical practice as elsewhere to be interested in financial reward, and until the conditions of service were laid down the profession could not give an opinion on any plan. Many doctors thought that in a salaried service there would be a forty-hour week. Would that be so?

Provision for post-graduate study would be essential in a salaried service and would be one of its advantages, and, also, full opportunity would have to be given for brilliant men. Some of a doctor's reputation came from his patients, but, more important, was his reputation among his *confrères*, and in the present system the good man came to the top quite quickly and gave great service to the community for the greater part of his life. In a salaried service where age counted for more than ability, brilliant men would be held back.

Dr. Ashton thought that, although a well-established man liked doing honorary work, many of the younger specialists were expected to do a great deal for nothing and they should be paid, and that a salaried hospital system would be more efficient.

He thought most medical men would be happier working under a group system on a fee-for-service basis, and would prefer such a system to a salaried service.

The Chairman stated that the committee had had the letter from the Minister before it and considered that the Minister referred to a complete scheme of medical service for the whole of Australia. The committee was looking at the matter from the point of view of a complete scheme or one in two parts. Was there any objection to something in the nature of a partial scheme of medical health services for Australia being established during the war?

Dr. Ashton stated that he considered such a proposal to be the thin end of a wedge, but agreed with evolutionary changes in health services to the community, the basic principle of which, on the curative side, must be the availability of medical care to any sick person. He thought there was a lot of loose thinking on the subject, as doctors were already providing medical services and few members of the community lacked attention. Of necessary medical work 80% could be dealt with by general practitioners, and, while specialist services were very necessary, they were not required by all patients, and the best method of assisting the community would be by raising the standard of general practice.

Correspondence.

SEMINAL CHANGES AFFECTING FERTILITY.

SIR: The article "Seminal Changes Affecting Fertility" in the issue of November 14, 1942, was very timely and will, I hope, cause many medical men to think in terms of abnormal semen in relation to their sterility patients. The excellent work which is being done by Dr. Gunn on ram's semen has its practical application to human semen, and after personal communication with him I have unhesitatingly used some of his methods in my own work.

Too much emphasis is placed on motility in the examination of human semen in Australia at present and not enough on morphology, the examination of which has been rendered easy by modern methods of staining. It should be remembered that just as in ram's semen, poor morphological types may be motile, but with a high percentage in any one specimen, it may be infertile or capable of producing miscarriage if fertilization occurs.

In distinction to ram's semen, it has been impossible to estimate the spermatozoan count on any one specimen of semen microscopically. In many cases a specimen which appeared normal in every respect by naked eye did not contain a single sperm.

As experimental work on human spermatozoa is only in its infancy and has but rarely been attempted in Australia, Dr. Gunn's conclusion that "the greater the degeneration of the semen the less the fertility" could only be applied to man after the study of a large number of seminal specimens from sterility cases, repeated miscarriages, moles (both carneous and hydatidiform) and stillbirths.

In the sterility clinic at the Women's Hospital the evidence was accumulating that Dr. Gumm's statement is equally applicable to human semen, and with post-war reopening I have no doubt that the facts will be made available to prove it.

Yours, etc.,

R. MACKAY, Major, A.A.M.C.,
A.I.F., Pathologist (on leave)
to the Women's Hospital,
Sydney.

December 12, 1942.

THE TREATMENT OF BURNS.

SIR: In the journal of December 12 reporting a discussion on burns at a clinical meeting in an Australian general hospital appears a statement similar to others one has read a number of times lately, namely: "In his experience practically every large tanned area became infected."

At another meeting on burns lately I inquired whether acriflavine was used with the tannic acid in the army, but, though an opinion was returned that it would be no good, my question was not answered.

I write now as one who is without modern experience of burns or army conditions in field or base, but who is very interested in "hospital infection" and out of pure ignorance ask why if acriflavine is the valuable preventive of bacterial multiplication which it is said to be by Professor Garrod (. . . "able consistently to prevent infection when experimental wounds in animals which have been inoculated with virulent bacteria") and by some eminent surgeons who favour its use in compound fractures, it is not also very valuable for such accessible surface wounds as burns when used as the solvent for tannic acid (Professor John Fraser *et alii* departmental report about 1935). Note, I am not expecting it to replace adequate cleansing under reasonably clean conditions, but only to prevent further infection then or subsequently.

I also observe in the same number of the journal ("Pooled Human Serum" by Morgan, Simmons and Biggs) that merthiolate one in ten thousand is used in preserved serum and that "two litres of serum caused no perceptible toxic effects among a large number of casualties treated with serum given intravenously". It occurred to me that these and similar observations might have value in resolving doubts re absorption of antiseptic from large raw areas as in the treatment of burns.

If my searchings have been many times dealt with elsewhere, I ask the forgiveness of the cognoscenti, but would equally be glad of fresh enlightenment.

Yours, etc.,

C. C. McKellar.

143, Macquarie Street, Sydney.

December 14, 1942.

TONSILS AND ADENOIDS.

SIR: Why are children affected with "tonsils and adenoids"? I do not think that you or any other person can satisfactorily answer this question. It has been stated that infection from repeated colds is the cause, but this is scarcely worth discussing, for the statement is rather an inversion of fact. It has been stated that poverty associated with bad dietary and living conditions is the cause. It may be a contributory factor, but it is not uncommon for a child of "well to do" parents who are extremely careful to provide the best of everything (including science) to be afflicted with diseased tonsils and adenoids, but in some of these cases the parents' care and good nourishment *et cetera* enable the child to resist to a great extent the local disease which is present, and to prevent immediate secondary consequences. Diseased tonsils and adenoids are obviously very often present at birth. The youngest case of beneficial removal of adenoids with which I have been associated was a child of ten days. The mother brought the child to hospital on her first day out of bed, as the child had much difficulty in taking the breast. Removal of adenoids on the advice of the late Dr. Hunter Todd resulted in immediate and marked benefit, an apparently happy and contented child and mother, instead of a crying peevish infant and a distracted parent.

Can you tell what is the cause of so frequent diseased conditions of the mucosa of the accessory nasal sinuses? Once again we find a condition which has its beginning probably in pre-natal life. It is not the result of local

infection, but is more likely itself a contributory cause thereof. It may be taken as true, except in the case of an accidental infection in a nasal accessory sinus caused by injury of some sort, or some pathological condition as a tumour, syphilis, foreign body *et cetera*, that the nasal accessory sinus disease called "sinusitis" involving one sinus involves all sinuses to a greater or lesser degree. Superimposed infection and conditions of ventilation and drainage have their effects upon the extent and results of infection and the treatment thereof.

Do you know what causes asthma? Can you inform your readers that nasal accessory sinus disease is a cause of bronchiectasis? I very much doubt it. It is known that these two complaints are not infrequently associated and that relief of the sinus condition at times is followed by some more or less temporary alleviation of the symptoms of bronchiectasis, but as for causation, this is veiled in obscurity, and occurs very early in life, probably whilst the future invalid is still *in utero*. Whooping cough which is at times accused of being a cause of bronchiectasis is probably a mere contributing factor to its noticed exacerbation. Migraine, Ménière's syndrome, a so-called temperamental nature, abnormal psychological manifestations, and many other departures from an assumed normal condition. What is the cause? A patient suffering from complaints of giddiness recently referred to a leading physician brings back the following: "Her story appears to me to be consistent with a vaso-apastic process, but whether the exciting cause is allergic to endocrine imbalance, I am afraid I could not discover."

The present and the last war in which we as a nation are and were involved have emphasized the problem of the psychological patient; it is generally acknowledged that the shock of battle or near battle is not the sole cause of the psychological manifestation, but that in the various psychoses, neuroses or whatever they are called, there has existed some previous psychological departure from the assumed standard of normality.

The functioning of man, as of any animal, must be dependent upon the chemical activity of his body, that is, his biochemical structure and activity.

All these disabilities and many more which bring about an incalculable amount of suffering and loss of effective man and woman power appear to be bound up with some biochemical—? vitamin (food)—or endocrine dysfunction, the latter perhaps dependent upon the former. This urgently calls for carefully organized and liberal State aided research into biochemistry, which is probably of far more importance than research into the causation *et cetera* of malignant disease, which is only a small part of the whole. This effusion has been brought to a head by meditation on the highly interesting and thoughtful Jackson Lecture by Professor Bostock as published in the journal, but his conclusions remind me of the unfortunate hungry individual who exclaimed: "If we only had some eggs we'd have some ham and eggs if we only had some ham." Notwithstanding this comment it must be realized that there is much "meat" in Professor Bostock's suggestions.

Yours, etc.,

ERNEST CULPIN.

Ballou Chambers,
Wickham Terrace,
Brisbane.

December 14, 1942.

THE EVOLUTION OF FUTURE MEDICAL PRACTICE.

SIR: From the title of this letter, your readers will gather that I am not convinced that any plan so far laid down will automatically usher in a medical millennium.

Reading some of the evidence recently published taken at the Federal Parliamentary Committee on Social Security, together with the printed reports of the discussion which took place at the last meeting of the Federal Council of the British Medical Association, it becomes obvious that there is no unanimity as to a salaried medical service being an unqualified success. The contrast in views is only to be expected, and reflects the divided views shared by the whole profession on the subject.

I would like to see a questionnaire sent to every practitioner in private practice, by way of referendum, seeking his views as to whether he would prefer: (a) complete salaried medical service; (b) complete national insurance, with medical lists and income limit; (c) no change at present till at least after the war and six months afterwards.

The more thinking and planning we have the more difficulties we find. By all means go on discussing the matter, as by that means many abuses of the present system are brought to light and attempts made to correct.

One objection to a complete salaried scheme is the question of compensation. Are those at present in private practices, many old established, going to be opposed by salaried men, and their takings thereby reduced, possibly entirely put out of practice, without any superannuation schemes or compensation of any kind?

Another problem which one feels the profession never tackles properly is that of hospital fees.

I have previously suggested that if the Federal Government offered to pay 50% of all hospital fees, public and private, this would relieve the taxpayer of a larger burden than the whole of his doctor's bills.

My idea of part-time salaries does not seem to have received much attention, but would it not be a smoother way of bridging the gap in an evolutionary manner, rather than the bull-at-a-gate method of complete salaried service proposed.

Thanking you for necessary space,

Yours, etc.,

H. T. ILLINGWORTH,
M.B., Ch.M.

Bruce Rock,
Western Australia,
December 14, 1942.

THE FUTURE OF MEDICAL PRACTICE.

SIR: The majority of medical men today agree that the practice of their profession is one of the highest callings in the world. Therefore the ideal must be the objective within our profession no matter how difficult its attainment. This I define as a service to the people by honest men and women who are willing to do all in their power to elevate health, educational and moral standards; it will be under the planned control of an honest and able body of men, medical and otherwise.

Ask yourself how far does our profession fall short of this definition; and again how does this objective appear possible under our present system. I argue that the answers to these questions are negative and that there is need for radical, perhaps revolutionary, changes. Together with other activities of society the medical profession can bewail its quota of bad influences and malpractices. Like many politicians, newspapers and radios *et cetera*, these factors are working for their own selfish interests to the detriment of the public, whether it be in small country towns, suburbs, Harley or Macquarie Streets.

I do not believe in the nationalization of the medical profession by political control under politicians such as they are today. Nevertheless it is inevitable. The probabilities are that this control will be bad, and that the public and ourselves will suffer accordingly. The world has never before writhed in such agony as today, made tolerable only by the great hope of a vastly better future. Such suffering makes it imperative that the public and ourselves fight our utmost to procure that honest and able control which will mean so much to medicine.

The price of rapid progress is often very high, but in the case of necessity we must surely be prepared to pay.

Yours, etc.,

C. S. BULL.

491, New South Head Road,
Double Bay,
December 15, 1942.

SIR: The future of young medical men now employed in the fighting services demands immediate attention. On their being demobilized, they will experience great difficulty in adjusting themselves to private practice. Lack of experience in the essentials of general practice, during their formative years, will be the result of the sacrifice these young men are making today. Many will carry the responsibilities of wives and families which service pay has enabled them to acquire earlier than in normal times.

Assuming that we, as an organized body, are not to be swept away in an avalanche of reform, we should set up a scheme under which these men can be absorbed without their suffering the bitterness of disillusionment and debt. It casts no reflection on them to say that they will be the willing acceptors of any scheme political or bureaucratic which might offer them immediate security. We must remember

that the political outlook of the younger medical men is more flexible and more advanced than that of their elders, who have acquired professional and financial security, but whose minds have hardened in the mould of yesterday.

If the care of ex-service doctors is left in the hands of the Repatriation Department delay and eventual improvisation will throw them and, possibly, the whole medical profession into a political scheme upon which we, as a professional body, will have little influence. If we are to control our own destiny, we must become a force with a clear purpose towards those whom it is our duty to rehabilitate. It may be necessary to employ numbers in general hospitals over short periods at service pay, and, possibly, to establish a system of apprenticeship throughout the country.

The important question of filling the thinning ranks of the various specialities is part of the problem. Will we have to depend on refugees or a few men and women who are unfit for service, who may readily seize the opportunity of specializing? After the last war many medical men found themselves able to study abroad under favourable conditions before returning home. At the end of this war there will be a great difference, and it will be a considerable time before the normal supply of specialists become available, if early arrangements are not set up for their training. Every effort should be made to establish centres for teaching special subjects, not only available to those unfit for service, but also to those on service. The fact that this may appear very difficult does not make it impracticable. A conference of heads of the medical services and faculties should be able to reach some working plan and set up suitable standards. Tolerance and breadth of view throughout the profession will be necessary for the success of any scheme.

It may be difficult to accept the suggestion that the retiring age of honoraries should be lowered to fifty years for a period of ten years after the war, in order to make more room and rapid advancement for repatriated men. The raising of the old controversy of dual appointments on teaching or semi-teaching hospitals may cause some bitterness. There is no doubt that the portal of entrance to practice at the public hospitals will have to be widened. Let us hope that these and other matters are not to become the subject of parliamentary legislation. I feel sure we are capable of reaching a solution of our own problem by careful study and adoption of a liberal outlook.

It would be well for service men to organize representation of their views and aspirations to the proper authorities.

Yours, etc.,

JOHN MAUDE.

British Medical Association House,
135, Macquarie Street,
Sydney.

December 18, 1942.

SIR: I have frequently and in public expressed my opinion of a nationalized hospital and medical service as I have lived and worked in countries where these systems—one or both—are in force. I hope we shall not see either of these in Australia.

I saw something of the results, but nothing so terrible as that described by Sir Beckwith Whitehouse, President of the British Medical Association, in the *British Medical Journal* of September 26, 1942, from which the following extract is taken.

My mind goes back to another experience. I was seated a few years ago in the large, perfectly equipped operation theatre of a State hospital in Utrecht. The surgeon, a salaried State professor, was performing an abdominal operation that is almost a daily occurrence in any large gynaecological clinic. The technique of surgeon and assistants was good, and the panoply of surgical ritual evident in all its detail. What impressed me, however, was the extreme length of the incision which seemed to extend over the whole abdomen. At the close of the operation I sought the reason for this apparent "furor operandi". I was informed that the length of incision was to provide a good view for the audience at the back!

I could add other side-lights on the inner working of various State-controlled European hospitals, where the gods of science and technique, efficiency and statistics, override other considerations; but this incident will suffice to indicate some shortcomings of a system which perhaps some would like to see installed in this country.

At the recent inquiry and discussion in Melbourne it was suggested by witnesses that patients should consult doctors

at an approved building and not at the doctor's home. To me the general practitioner in the home is the high priest of preventive medicine. If we cut out the family relationship we also cut out the soul of British medicine as Sir Beckwith Whitehouse indicates.

What is wrong fundamentally with the present system? It can be improved in many ways, but there is no need to substitute something else which leads to such incidents as that related. There is no need to burn down the house to get roast pig.

We get an example of the dead hand of official control in the bush nursing systems of New South Wales and Tasmania where these hospitals have been limited to two beds. In Victoria, where the system is decentralized, there are sixty-three hospitals with about 700 beds and all paying their own way and managed locally subject to some general rules.

In giving evidence myself, I said all that they wanted was to be let alone. If nurses are available there will be many more hospitals opened.

Yours, etc.,

JAMES W. BARRETT.

103-105, Collins Street,
Melbourne,
December 18, 1942.

Sir: In the discussions for or against a "National Medical Service", little consideration has been given to the compensation due to the present practitioners of medicine.

Assuming that medicine will become another public service, then it is important that the change over should be complete, and that no existence of competitive rivalry should be allowed between such a service and private practice. The main opposition to any national medical scheme must naturally be due to the failure to forecast adequate compensation to the existing medical practitioners, to whom such compensation is of paramount importance for the satisfactory conclusion of medical practice as it is dispensed today, and every medical practitioner has commitments which he is compelled to respect and which can be assessed as his capital outlay to maintain the existing service which he in part delivers to his clients in particular and the State in general.

Give the practitioner a tangible idea of the manner in which compensation will be paid, and I submit the step to nationalization will be simple and complete. When the State acquires the rights of any business, factory or other undertaking, compensation is paid to the owners. The equity in medical practices demands similar treatment.

When the State has acquired the rights of medical practice, the medical practitioner has nothing to fear in nationalization; in fact it offers great opportunities to the profession and should embrace every specialist and every phase of medicine, so that a complete service without reservations, and ample considerations for setting up teams and rosters for work, time for study and recreation, and an adequate pension commensurate with the important service a life dedicated to medical practice should deserve.

In conclusion, what more can we demand than to be free to deliver medicine to the people, unfettered by the burden of the overhead, confident that all the forces of scientific investigation are coordinated behind an official status for the betterment of the health of the nation.

Let Australia build a national medical service that will be a lead and an inspiration to the rest of the world.

Yours, etc.,

HARRY R. SCRIVENER.

732, Pacific Highway,
Gordon,
New South Wales,
December 18, 1942.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Brodie, Gordon Marcus, M.B., B.S., 1940 (Univ. Sydney),
33, Cheltenham Road, Cheltenham.
Powys, Norman Skelton, M.B., B.S., 1942 (Univ. Sydney),
2, New South Head Road, Vaucluse.

Obituary.

RALPH OSMOND WILLIAMS.

WE regret to announce the death of Dr. Ralph Osmond Williams, of Goulburn, which occurred on December 19, 1942, at Sydney.

Naval, Military and Air Force.

CASUALTIES.

ACCORDING to the casualty list received on December 17, 1942, Captain C. S. Donald, A.A.M.C., who was previously reported missing, believed drowned by enemy action, is now reported drowned by enemy action.

Books Received.

"A Textbook of Biochemistry for Students of Medicine and Science", by A. T. Cameron, M.A., D.Sc. (Edinburgh), F.R.C.S.; Sixth Edition; 1942. London: J. and A. Churchill, Limited. 8½" x 5½", pp. 384, with 28 illustrations. Price: 15s.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmmain United Friendly Societies' Dispensary; Leichhardt and Peteraham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phoenix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia.

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VOL. II—29TH YEAR.

SYDNEY, SATURDAY, DECEMBER 26, 1942.

No. 26.

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